NATURAL RESOURCES

DRAFT ECONOMIC ENVIRONMENT

DISCUSSION PAPER

YUKON 2000

Disclaimer:
This discussion paper reflects the consultants viewpoints. It does not necessarily reflect the Yukon Government's viewpoints.

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PREFACE

This paper on natural resources has been prepared for the YTG Department of Economic Development: Mines and Small Business, as part of the YUKON 2000 Development Strategy. It is one of six studies of aspects of the Yukon's socioeconomic environment (the others are: human resources; financial resources; information resources; infrastructure; and structural characteristics).

The tasks of the paper (as set by the Terms of Reference) are:

1. To develop a series of objectives for the management of natural resources that take into account the overall YUKON 2000 goals. The objectives should have a broad base of support or potential support among Yukoners; and should provide a context for decisions on the allocation of natural resources.

2. To develop a series of guiding principles for the allocation and management of Yukon's natural resources. The principles should enable progress toward the objectives identified under task 1.

3. To identify and discuss the major implications of these principles for natural resource users and the economy in general. This includes a discussion of relationships among the principles, competing demands for resources, trade-offs, costs imposed by one resource-use on other resource-uses, and mutual benefits among resource-uses.

4. To recommend methods for resolving competing demands for resources; and to suggest a framework and structures for implementing such methods.

5. To recommend specific actions by the public and private sectors to implement the proposed principles and methods. This includes a discussion of the implications of existing resource management control and jurisdiction, and of land claims and devolution.

Tasks 1 and 2 are addressed in Chapter 1. Tasks 3, 4 and 5 are addressed in Chapters 2, 3 and 4 respectively.

Robert and Christine Prescott-Allen are responsible for the overall direction of the paper and for the content of material on renewable resources. Robert W. Hornal is responsible for the content of material on nonrenewable resources.

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1. GOALS, OBJECTIVES AND PRINCIPLES FOR MANAGING NATURAL RESOURCES IN THE YUKON

Socioeconomic goals

1.01 Through the YUKON 2000 process, Yukoners have identified the following socioeconomic goals (Yukon Development Strategy Fall Conference Report):

Goal A. The option to stay in the Yukon

The first priority for socioeconomic development is to ensure that people who have already chosen to make the Yukon their home should have secure and stable opportunities to support themselves.

Goal B. An acceptable quality of life

Development should enhance and preserve the quality of life of Yukoners. What this means depends on the individual, but it includes the freedom of individuals to make choices. It also includes a combination of material and nonmaterial benefits: wages at least comparable with national standards; a good return on capital invested and time devoted to business; continued access to renewable resources so that non-wage lifestyles can survive; public services consistent with national standards; enjoyment of the Yukon's natural environment--land, forests, rivers, lakes, mountains and wildlife.

Goal C. Control of the future

Yukoners want and intend to have greater control over future development in the Yukon. This includes greater community control, higher levels of ownership by Yukoners, and greater political and economic autonomy (including transfer from Ottawa of administration of land and resources).

Goal D. Equality

The opportunity for all Yukoners to participate in the economy on equal terms--with particular reference to equality of opportunity between Indians and non-Indians; and, within the Indian and non-Indian economies, to women, youth, the elderly, and the disabled, who do not yet have access to this opportunity.

Objectives for the management of natural resources in the Yukon

1.02 The socioeconomic goals suggest that the Yukon's natural resources should be allocated and managed to achieve the following objectives (numbered to distinguish them from the goals):

1. Develop the full range of the Yukon's natural (renewable and nonrenewable) resources

   This objective recognizes (a) the need for economic development, to provide Yukoners with secure and stable opportunities to support themselves and achieve an acceptable quality of life; and (b) the need for economic diversification, to take advantage of the Yukon's diversity of resources and to reduce the risk of economic recession due to the collapse of a particular sector or the loss of a particular market. Economic development can be facilitated by providing infrastructure, financial services, etc., and by adopting simple and straightforward procedures for allocating and managing resources. Economic diversification involves seeking out a greater variety of developments that are economically viable. The Yukon's economic and geographical situation (small internal market, advantageous position with respect to some external markets [Alaska, Japan], disadvantageous position with respect to other external markets [rest of Canada and the United States], climatic limitations on agriculture, naturally low productivity of lands and waters) necessitate making the most of all its renewable and nonrenewable assets. This calls for encouraging development of both nonrenewable and renewable resources; and, among the renewables, of developing several small industries based on a variety of resources (timber, agriculture, fur, fish, game, tourism, etc.), as long as each is economically viable.

2. Increase the economic return to the Yukon from its natural resources

   There is a need not only to develop a greater variety of nonrenewable and renewable resources (objective 1), but also to get a higher return per unit of resource produced: more jobs for Yukoners and more money spent in the Yukon. Ways of achieving this include increasing value added (for example, by manufacturing the products made from the Yukon's natural resources, and exporting the products instead of just the raw materials), and using resources more productively by reducing waste. This objective also includes increasing Yukoners' ownership of resource-based businesses.

3. Develop the Yukon's nonrenewable resources to assure more stable economic growth

This objective recognizes that, although nonrenewable resources are exhaustible, they can be developed so as to provide a high return to Yukoners through bad times as well as good (for example, by mining poorer grade ores during good times and better grades during bad times, and exploration to increase the life of the mine). As far as practicable, nonrenewable resource development should provide employment and income to people who have already chosen to make the Yukon their home.

4. Develop the Yukon's renewable resources sustainably

Sustainable development of renewable resources means maintaining the productivity and renewability of the resources that are being developed. The renewability of renewable resources is important because it enables users to obtain an economic benefit both now and over the long term. It thus provides a degree of security and stability to current users of renewable resources, while making it available for future users. Sustainable development of renewable resources does not mean that nonrenewable resources should not be developed; nor does it mean that an area of forest should not be cleared for agriculture. It means that harvest levels (of trees, fish, furbearers, game animals, etc.) should be within the capacity of the resources to regenerate, and that agriculture should maintain the productivity of the soil. It is of course possible to increase the capacity of resources to regenerate, through research and development (see Chapter 2).

5. Provide for subsistence lifestyles and maintain the natural resources required for subsistence

Subsistence harvesting is at the heart of native identity, culture, and way of life, and is the basis of the Indian economy. It is also a useful source of food and fuel for many non-Indian Yukoners. Continued access to renewable resources so that non-wage lifestyles can survive is singled out as part of the goal to achieve an acceptable quality of life. This requires that harvest levels are sustainable; and that the critical habitats (habitats needed for feeding, breeding, migrating, and/or sheltering) of resources harvested for subsistence are maintained.

6. Safeguard the natural environment and heritage of the Yukon and maintain its renewable resources

Enjoyment of the Yukon's natural environment is an important part of the quality of life of Yukoners. Economic development can and should be in addition to, not instead of, this enjoyment. The heritage of the Yukon includes natural, archaeological and historical features that are unique to the Yukon and/or represent significant aspects of past and present ways of life of the Yukon's Indian and non-Indian

peoples. Examples of these features should be retained for their cultural value (they also have potential economic value, e.g. for tourism). Maintaining the diversity and productivity of the Yukon's renewable resources is also necessary to retain the capacity to adapt successfully to economic and environmental changes and to achieve new goals and objectives that Yukoners may identify (what this means in practice will be considered in Chapter 2).

7. Give Yukoners control of the allocation and management of natural resources in the Yukon

   This objective reflects Goal C: Yukoners want and intend to have greater control over future development in the Yukon. Yukoners are the ones who have to live with the consequences of decisions concerning the allocation and management of natural resources. Therefore, they should make them. The vulnerability of Yukoners to external economic forces is partly due to lack of control over demand (markets) for Yukon products, and partly to lack of control over the supply of products. Vulnerability to changes in markets can be reduced somewhat by diversification (putting the Yukon's economic eggs in several baskets, as called for by objective 1). Control of supply can be increased by obtaining responsibility for decisions on land and water uses.

8. Fulfill Canada's national and international responsibilities for natural resources of national and world significance

   This is the counterpart of the previous objective, recognizing that some of the natural resources of the Yukon are of national, and even world, value. Management control carries with it the responsibility both to develop certain major resources in the national interest (e.g. minerals); and to conserve nationally and internationally significant renewable resources (e.g. unique species and populations of plants and animals)--in partnership with the federal government.

9. Harmonize these objectives through procedures for allocating and managing land and water uses designed to accommodate the needs and values of Indian and non-Indian peoples and of the various communities and interest groups of Yukoners

   This objective responds to the potential incompatibilities among the other objectives for managing natural resources, which in turn reflect potential incompatibilities among--and even within (for example, Goal B: a good return on capital invested versus enjoyment of the natural environment)--the socioeconomic goals.

1.03 These objectives are not in order of priority, but they are in logical sequence. The first two are general resource development objectives, stating the aims that resources be developed, that as great a variety as prac-

ticable of economically viable developments be encouraged, and that Yukoners get more money and jobs from each development. They respond to the desire of Yukoners (expressed in goals A and B) to have a material standard of living comparable with the rest of Canada. The next two objectives (numbers 3 and 4) concern the manner of development of nonrenewable and renewable resources respectively, to combine development today with provision for development tomorrow. Yukoners want to escape from the cycle of boom and bust to a form of development that is more stable and secure. Objectives 5 and 6 reflect the stated wish of Yukoners to maintain two features in particular of the socioeconomic environment of the Yukon: subsistence; and enjoyment of the natural environment. As far as possible, ways should be found of achieving both groups of objectives: stable economic development and maintenance of subsistence lifestyles and enjoyment of the natural environment. Objectives 7 and 8 arise out of Goal C (control of the future): one states the aim of Yukoners to have control of decisions concerning land and water uses; the other states the obligations that go with such control. Finally, the last objective recognizes that Yukoners are a diverse group of people, including two major cultural groupings (Indian and non-Indian) and numbers of different sectors and interest groups. Furthermore, individual Yukoners (like everyone else in the world) want a variety of seemingly contradictory things out of life: for example, a high material standard of living plus enjoyment of wilderness. The socioeconomic goals reflect this diversity. Doing our best to accommodate it is what policy making and resource management should be all about.

Principles for allocating and managing land and water uses in the Yukon

1.04 Discussing the suggested principle "Multiple use of a resource should be favoured over single use wherever possible", the YUKON 2000 Fall Conference asked: "Does multiple mean all things everywhere or everything somewhere?" (Yukon Development Strategy Fall Conference Report). The answer must be "everything somewhere", since "all things everywhere" is obviously impossible. Other comments, both those supporting the intent of the principle and those expressing concern about its practical application, suggest that the term "multiple use" tries to say too many things at once and so causes confusion. Some uses of natural resources are incompatible

with others; consequently a choice has to be made about which use goes where. The intent of the term "multiple use" is that all interest groups should be accommodated (somehow, somewhere) and that we should try to identify compatibilities among uses before allocating a particular area exclusively to one use. For the sake of clarity, it is better to drop the words "multiple use" and express these principles separately.

1.05 The following principles are aimed at assisting Yukoners to achieve an acceptable combination of the first eight natural resource management objectives through achievement of the ninth objective:

a. Accommodate the needs and values of Indian and non-Indian peoples and of the various communities and interest groups of Yukoners

This repeats the ninth objective, but it is such an important principle that it bears repetition. Resource economists and planners are trained to allocate resources according to principles of efficiency, cost-effectiveness, and optimum benefit to "society as a whole" (Thompson & Rueggeberg 1986). But in plural societies, such as those of the Yukon and the rest of Canada, different groups of people have different needs and different concepts of benefit, depending on their way of obtaining a living, cultural background, and value system. The notion of optimum benefit to society as a whole tends to ignore these differences. But once acknowledged, it is usually possible to accommodate somewhere all the different interests. In turn, genuine efforts to do so are necessary to create the spirit of cooperation and compromise that makes us a "society as a whole".

b. Retain options

Land and water uses should be so located and managed that as many options as possible are retained. One reason for this is ethical: the moral obligations to future generations not to foreclose their options, and to leave them a world that is at least as productive and diverse as the one we enjoy--expressed in the saying, "we have not inherited the earth from our parents, we have borrowed it from our children". The other reason is practical: the "long term" is shorter than we think. Markets and economies change, as do the natural environment and people's concerns and priorities: we need to retain the capacity to repond successfully to such changes. As far as possible, therefore, development today should not be at the expense of development tomorrow.

c. Identify compatible benefits

The allocation process should first identify those natural resource benefits (or land and water uses*) that are compatible. Putting identification of compatibilities before identification of conflicts minimizes the arbitrary designation of single use areas and maximizes the potential for accommodating different interests. All uses should be defined precisely. Care should be taken to distinguish those uses that are compatible regardless of management, and those uses that are compatible provided they are managed. The management requirements for the latter group of uses should be described clearly; and these uses should be considered compatible only when the required management systems are fully operational.

d. Adopt a cross-sectoral approach that integrates conservation and development

A cross-sectoral approach is one that considers the needs of all peoples, sectors (such as mining, trapping, agriculture, tourism) and interest groups when allocating particular land and water uses. In effect, "conservation" means maintenance, and "development" means production. Integrating the two means adopting policies and practices to enable the achievement of development and conservation at the same time. This is a more positive approach than simply regulating development. It also has a better chance of ensuring that development achieves the results expected of it; and that development of one sector is not at the expense of other sectors considered to be as important.

e. Accommodate incompatible uses by allocation and scheduling

Principles c (identify compatible benefits) and d (adopt a cross-sectoral approach that integrates conservation and development) aim to reconcile apparently or potentially incompatible uses through appropriate policy making, planning, and management. Some uses will remain, however, that are incompatible with each other. You can't build a housing subdivision on farmland and expect to farm: you either have one or the other. Management of harvesting is necessary to ensure that access provided by mining roads does not result in overharvesting of wildlife; but no amount of management will make mining roads compatible with wilderness tourism. Incompatible uses should be accommodated by allocation or scheduling. Allocation means giving priority or

*Note: Some people limit the word "use" to consumptive uses of resources (such as harvesting, mining, farming). Throughout this report, we use the word "use" in its general sense, including nonconsumptive values (such as birdwatching and enjoying views). As such, "benefit" and "use" are interchangeable.

exclusivity to a particular use in a particular place. Scheduling means giving priority or exclusivity to a particular use at a particular time.

f. Designate priorities

A system of priorities should be developed to determine which incompatible uses should go where at what times. Uses that are site-limited (uses that depend on a very restricted number of sites, such as mines, hydropower stations, traditional harvesting areas, and the habitats of certain plants and animals) should have priority over uses for which there is a greater choice or availability of sites. A system of priorities is a decision-making tool, to be applied only when one use must be chosen over another. In such circumstances, and if all other things are equal, then other criteria for designating priorities among uses could be:

Subsistence uses before commercial uses before recreational uses. Subsistence is put before commercial because the subsistence user is providing for basic needs and has less margin of choice over where to conduct his or her subsistence activities. Commercial uses also provide for basic needs (and so are put before recreational uses), but commercial activities are generally more flexible and have more room for manoeuvre than subsistence. Subsistence therefore has priority of access to a harvested resource, followed by commerce, followed by recreation.

Economically major uses before economically minor uses. Economically major here means uses that provide substantial employment and income for Yukoners. Other things being equal, it makes sense to choose the big money earners over the small money earners.

Uses of renewable resources before uses of nonrenewable resources. The renewability of renewable resources is a valuable characteristic, allowing users of renewable resources to have their cake and eat it too. Use of nonrenewable resources is, by definition, one time only. Other things being equal, it makes sense to go with the renewable use.

Uses with strong cultural values over uses with weak cultural values. Some uses, such as subsistence harvesting and placer mining, have high cultural value as well as economic value, having long-standing and deep associations with a particular way of life and/or a particular community. Other things being equal, these uses should have priority over uses that do not have such associations.

An existing use before a new use ("grandfather" rights). Other things being equal, the existing use of an area should have priority over any new use.

Community needs before Yukon needs before Canadian needs before international needs. The ability of a community to pay its way by developing its own resources is usually of more value to it than trickle down benefits from national development projects or the international prestige of national conservation projects. Community needs should be met; and wider needs should be demonstrably more compelling before they are allowed to override community needs.

Resources of world significance before resources of Canadian significance before resources of Yukon significance. This applies in particular to the determination of what is unique or special enough for conservation to override development; or for development to override conservation.

All of these suggested criteria should be qualified with the proviso, "other things being equal". In many cases, either of two competing uses might be considered to have priority depending on which sets of criteria were adopted. Examples of such situations will be discussed in Chapter 2.

In certain areas that are particularly important for conservation, it will be necessary to designate priority uses--uses that are given priority over all other uses at all times. Other uses may be allowed, depending on their compatibility with the designated priority use (priority designation being required in case unforeseen incompatibilities arise).

1.06 Like the objectives, these principles are not in order of priority, but follow a logical sequence. The first principle is the umbrella principle (every Yukoner should benefit). The other five are the principles that should be followed to apply the first principle. Principles b, c and d cover what to do to increase the possibility of identifying and taking advantage of compatabilities among different uses and user groups. Principles e and f cover what to do about any incompatibilities that remain. The principles thus form a package to guide policies and decisions about the management of natural resources in the Yukon.

1.07 The mechanisms required to apply these principles include:

a. Environment and development planning.

b. Socioeconomic and environmental impact assessment of particular development options and projects.

c. Designation of reserves and other special use areas, to give priority to uses (human activities, ecological processes, or populations of animals and plants) with special site requirements for development or conservation.

d. Harvesting regulations.

e. Siting and operating standards and regulations for land and water uses other than harvesting.

1.08 The purpose of environment and development planning, and socio-economic and environmental impact assessment, is to help people make choices about their future, in light of an appraisal of the costs and benefits (risks and rewards) associated with alternative uses of natural resources and the environment. Their value depends heavily on how much people are in a position to make choices: how much control they have over decisions; on the distribution of the potential costs and benefits (whether they will fall equally on the same group of people); and on how well people know and understand the potential costs and benefits of each choice. Thus there are two additional principles for allocating and managing land and water uses in the Yukon:

g. Give Yukoners control

"Decisions should be made in the Yukon, by Yukoners and for Yukoners" (Yukon Development Strategy Fall Conference Report). Socioeconomic goal C (greater community control, higher levels of ownership by Yukoners, and greater political and economic autonomy, including transfer from Ottawa of administration of land and resources) and natural resource management objective 7, also state this essential principle for allocating and managing natural resources.

h. Provide adequate information

Allocation and management of land and water uses depend on information--on the location and abundance of nonrenewable and renewable resources; on grades and quantities of mineral resources; on the ecological requirements and behaviour of renewable resources; on the needs, values and concerns of Indians and non-Indians and of the various communities, interest groups and sectors that benefit from (and/or have an impact on) natural resources; on actual and potential harvest levels; on socioeconomic importance; on changes in markets; on management requirements and capabilities; and so on. Such information is especially important for allocation and management according to the principles proposed here (accommodate all communities and interest groups; retain options; identify compatible benefits; adopt a cross-sectoral approach; integrate conservation and development; accommodate incompatible uses through allocation and scheduling; designate priorities)--since these things can be done only with reliable (and relevant) infor-

mation. Information needs should be identified on the basis of these principles, and research priorities determined accordingly. There should be a two-way flow of information: to and from bands, communities, resource users, scientists and government. Bands, communities and resource users know their own needs, values and concerns, and should be given opportunity and means to communicate them. They also know a good deal about the resources with which they live and work, and should be given opportunity and means to share their knowledge. In return, bands, communities and interest groups should be given the opportunity to propose (and comment on proposed) scientific and technical research projects; and the results of scientific and technical studies should be communicated to Yukoners in a form that is readily understood. Getting and disseminating information take time and money. The next chapter considers the practical implications of this principle.

2. MAJOR IMPLICATIONS

2.01 This chapter considers the major implications of the principles proposed in Chapter 1 for allocating and managing land and water uses in the Yukon. It reviews the main groups of natural resource users, summarizing their current and potential economic contributions to the Yukon economy, and discussing their operational needs with respect to land and water uses (including the extent to which they are site-limited) and any significant compatibilities and incompatibilities with other uses. More space is devoted to renewable resources because there are many more linkages and interactions among renewable resource sectors than there are among nonrenewable resource sectors or between nonrenewable and renewable resource uses. The chapter then reviews ways of taking advantage of the major compatibilities and of addressing the major incompatibilities on the basis of the proposed principles. It concludes with a summary analysis of the chief implications of these principles for the Yukon economy in general.

Mineral industry

2.02 The Yukon's mineral industry has a colourful and important place in the history of the Yukon. It has for most of the past century been the Yukon's largest source of new wealth and it has the potential to remain the dominant industry of the Yukon for years to come. In recent years (1982-86, Table 1) the industry has been struggling to adapt to new international forces (low metal prices, increased competition, volatile gold prices etc.) but the Yukon offers good geology, easy access to the sea, and favourable legislation, all important factors to the continuous existence of a viable industry. The mineral industry is one of the largest supporters of the transportation and service industries in the Yukon.

2.03 The industry can be divided into three separate phases--exploration, development, and producing--and two sectors: hardrock mining and placer mining. Each phase of the industry makes different demands on the natural resources of the Yukon.

Exploration

2.04 The exploration phase of the industry involves the identification of concentrations of minerals which have the potential to be developed economically. This phase requires easy access to all areas of the Yukon for prospecting, for staking, for geological, geochemical and geophysical surveying and for the sampling of potential deposits by trenching and diamond drilling. Access in the early stages of exploration is by foot or helicopter but in the later stages vehicles are often used and access roads are constructed. Present legal arrangements allow prospectors to operate on staked claims as needed but require permits to operate on unstaked ground. Exploration crews cover large areas of ground during a summer season but leave little evidence of their passing and have limited conflicts with other natural resource users.

Development

2.05 Once an exploration crew or prospector has identified a deposit with the potential to produce minerals economically, the development phase of the industry begins. This phase requires the testing of the prospect by extensive diamond drilling and/or by surface or underground mining to determine the size and shape of the deposit, the conducting of environmental and socioeconomic studies necessary to determine the best mining practices required and the examination of the market to determine profitability. If all factors are positive, the property is then developed into a producing mine. This process may include the construction of bunkhouse facilities as well as the development of mining and milling infrastructure and transportation infrastructure.

2.06 The development phase of the industry is both site specific (the deposit's site dictates the mine site) and more general (transport routes and community sites can be altered if they are in conflict with other users). All developing properties require water and some form of relatively easy access (access road, airstrip, wharf etc.). The development phase may take from two years to several decades depending on the economics of the mineral deposit.

2.07 Once the development phase is completed the property enters into the producing phase, which is labour intensive and site specific. Environmental terms and conditions are applied before startup, and state-of-the-art technologies can be applied to avoid pollution. The concentration of people at a mine or placer site can place additional pressure on local wildlife resources but this can be controlled by regulation. In other parts of Canada it has become commonplace to use a rotating work force if the mine site is remote. In these cases recreation is limited at the site and takes place in the home community from which the personnel are rotated.

Hard rock mining

2.08 Three lode mines were active in the Yukon in 1981, providing work for 975 persons: United Keno Hill Mines Ltd. (silver-lead-zinc) at Elsa; Cyprus Anvil Mines Ltd. (lead-zinc-silver) at Faro; and Whitehorse Copper Mines (copper-gold-silver) at Whitehorse. By 1986, four mines were operating, with 772 employees, at: Keno Hill (United Keno Hill's silver-lead-zinc mines; Plata-Inca's silver-lead mine); Faro (Curragh Resources' zinc-lead-silver mine); and Wheaton valley (Mount Skukum gold mine) (Exploration and Geological Services Division 1982; Mineral Resources Directorate 1987; Yukon Department of Economic Development 1986). The industry expects the value of production to return to previous high levels (YUKON 2000 Development Strategy Sectoral Report on Mining).

Placer mining

2.09 Since 1982 placer (gold) mining has accounted for most of the value of mineral production in the Yukon. Most operations are in the Dawson City area, and are generally a reworking of claims originally mined at the time of the 1898 gold rush. Between 1981 and 1985, about 213 placer mines were in operation each year. They provided seasonal employment for 500-700 persons (not all of whom were year-round residents of the Yukon). Most of the gold produced in the Yukon is from small, seasonal bulldozer and sluice box operations, employing five or fewer workers (Brown & Cline 1986; Yukon Dept of Economic Development: Mines & Small Business & Canada Dept of Indian Affairs and Northern Development 1986).

2.10 In summary the mineral industry can operate compatibly with a number of other natural resource uses, the main exception being wilderness tourism (see also paragraph 2.87d). The industry requires large areas of land for its exploration endeavours but these areas are very quickly narrowed down to a few hectares where site specific activities are then conducted.

Native subsistence harvesting

2.11 Subsistence resources are harvested for personal consumption or consumption by the harvester's immediate family or community (depending on the community's system of exchanging and sharing resources). Distribution of the resource from harvester to consumer seldom involves money--establishment and maintenance of the relationship between harvester and consumer being the medium of exchange. Subsistence includes: personal or family consumption (use for food, animal feed, clothing, equipment, shelter, fuel, transportation); sharing and exchange (barter); customary trade (some peoples have a traditional trade among themselves--for example, sharing meat with persons who can supply meat in return, but selling it to those who cannot); and commercial trade in the nonedible byproducts of wildlife taken for personal or family use.

2.12 Subsistence resources have two kinds of value: cultural and psychological value, for which there is no monetary equivalent; and utility value (value of the product or service that the resource provides), for which a monetary equivalent can be estimated. Among aboriginal peoples, the cultural value of subsistence harvesting is as important as the utility value. It strengthens ethnic, community and individual identity; it confirms continuity with the past and provides hope for the future; it expresses a traditional relationship with animals, plants, and the natural world; and it maintains bonds among generations, families and individuals in each band. Notwithstanding participation in the wage economy, or the adoption of modern harvesting technologies (such as guns, trucks, and powerboats), subsistence harvesting is at the heart of native identity, culture, and way of life. It is an aboriginal right--a right to which natives are entitled as the original inhabitants of what is now the Yukon. For this reason, native and non-native subsistence harvesting are treated separately.

Country food

2.13 Data on native subsistence harvesting come from studies of three bands--Old Crow (Murphy 1986), Ross River (Dimitrov & Weinstein 1984), and Teslin (Duerden 1986)--comprising about 16% of the Yukon's native population; and a study of the salmon food fishery by the 11 Yukon bands that fish for salmon (Seigel & McKenzie 1985). The studies provide data on subsistence harvesting of fish, mammals, and birds; but not plants (except for fuelwood cutting at Old Crow and Ross River--see below).

2.14 Table 2.2 summarizes the data on the supply of country food (wild meat and fish) to the three bands. In Old Crow, the average per capita supply of country food is 333.7 kg; in Ross River, 288.0 kg; and in Teslin, 124.2 kg. These differences reflect real differences in the relative importance of country food to each band. Using noncomparable methods, Dimitrov & Weinstein (1984) estimate that subsistence harvesting provides 80% of Ross River's consumption of meat and fish; whereas Duerden (1986) estimates that it provides 21% to 40% of Teslin's consumption of meat and fish. (There are no data for Old Crow.) Furthermore, a proportion of the harvest is fed to dogs. Murphy (1986) assumes that all but 25% of the harvest of all fish species except chinook salmon and coho salmon is used as dog feed*. Duerden (1986) assumes that 1,931.8 kg of harvested meat and fish are fed to 100 dogs in Teslin (or 19.3 kg/dog/year). (The Ross River assumptions are not given.) The researchers also use different methods and assumptions concerning other aspects of the harvest: for example, the average edible weight of the harvested species.

2.15 Despite these differences, it is clear that subsistence harvesting provides a substantial proportion of the native food supply and remains the basis of the native economy. If the average per capita supply of country food for the three bands (248.6 kg) is the average for the whole

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Note: * However, this assumption is based on the situation in 1973, when dogs were more important than today (Murphy 1986).

of the Yukon, then native subsistence harvesting produces 994,000 kg of country food a year (assuming 4,000 native persons*). Using an average price per kg of $9.00, the equivalent monetary value of the native country food harvest in 1985 dollars would be about $8.95 million a year**.

2.16 The proportional contributions of fishing and hunting to the supply of country food range from fishing 14% and hunting 86% in Old Crow, to fishing 35% and hunting 65% in Teslin (with Ross River in the middle--fishing 24%, hunting 76%). Among the hunted animals, large mammals (virtually entirely moose and caribou) account for 96% of the wild meat supply of Old Crow (small mammals 4%, birds less than 1%); 96% of that of Teslin (small mammals 2%, birds 1%); and 85% of the wild meat supply of Ross River (small mammals 14%, birds 1%) (Tables 2.2 & 2.3). Native communities harvest a large number of animal species (the Ross River Band, for example, estimates that it uses more than 50 wild species for food [Dimitrov & Weinstein 1984]). And different species are of significance to each--caribou is of prime importance to the people of Old Crow, whereas the harvest of chinook salmon is key to the subsistence of the Selkirk Band (Murphy 1986; Seigel & McKenzie 1985). The species composition of each community's diet is also influenced by the availability of the wild resource and the nature of the annual subsistence cycle. In the spring and early summer, the Teslin Band concentrates its subsistence efforts on fishing, but in the fall, the emphasis is on moose hunting (Duerden 1986).

Notes: * Based on the number of status Indians (probably a lower number than the lands claims registration total, but this is believed to be offset by the fact that subsistence harvesting by members of the Whitehorse native population is much less than by native persons outside Whitehorse) (Yukon Dept of Economic Development: Mines and Small Business & Canada Dept of Indian and Northern Affairs 1986).

** The cost of buying locally the same quantity of commercially available food of equal nutritional and culinary value is a measure of the equivalent monetary value of subsistence food. The figure of $9.00/kg chosen by Yukon Dept of Economic Development: Mines and Small Business & Canada Dept of Indian and Northern Affairs (1986), is calculated by deflating weighted 1986 Whitehorse beef, chicken, salmon and whitefish retail prices to 1985 levels and inflating the figure by 30% to account for higher prices outside Whitehorse. Beef, chicken, salmon and whitefish are taken to be equivalent to wild mammal (big and small game) meat, bird (waterfowl and upland game bird) meat, salmon and freshwater fish respectively.

Fuelwood

2.17 Fuelwood consumption estimates for Old Crow range from 400-500 cords a year (4.5-6 cords per household) (Fuller & McTiernan 1986) to 1,000 cords a year (11.5 cords per household) (Murphy 1986). In Ross River 86% of households are reported to rely entirely on wood for heating. Most of the remainder use either wood plus electricity (8%) or wood plus oil (3.5%). (No data are given on consumption per household [Dimitrov & Weinstein 1984].) Based on these scanty data, and on fuelwood use among households in Whitehorse with airtight stoves (5 cords/household/year), Yukon Dept of Economic Development: Mines and Small Business & Canada Dept of Indian and Northern Affairs (1986) estimate that native households consume an average of 6 cords/household/year. Assuming that at least a quarter of this wood is bought from commercial suppliers, the volume of domestically gathered fuelwood is estimated to be some 5,000 cords (11,330 cubic metres) a year. The equivalent monetary value of this fuelwood is estimated to be $750,000*.

Economic importance and operational needs

2.18 Taken together, native harvesting of country food and fuelwood has an equivalent monetary value of $9.7 million a year; or about $2,425 per capita, based on a native population of 4,000. This is a major contribution, especially in relation to the average income of Yukon Indians ($9,000 in 1980) (Coates 1986). The subsistence harvest enables native communities to survive periods of economic recession; and, since country food is often distributed widely, from the most successful harvesters to the most needy members of the band, it helps to reduce income disparities in the commu-

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Note: * Yukon Dept of Economic Development: Mines and Small Business & Canada Dept of Indian and Northern Affairs (1986) make the following additional assumptions and calculations to arrive at this estimate: (a) 4,000 Yukon natives with average household size of 3.5/household = 1,143 households; (b) value of the fuelwood is $66.20/m^3$ or $150/cord (higher than the 1985 commercial fuelwood price of $70/cord but lower than the equivalent local price of substitute heating oil of $227/cord, to allow for the availability of commercial fuelwood in some areas but not in others.

nity (Yukon Dept of Economic Development: Mines and Small Business & Canada Dept of Indian and Northern Affairs 1986). For native subsistence to flourish, harvest levels must be sustainable, the critical habitats of harvested species must be maintained, and native harvesters must be able to earn money (from commercial harvesting, native enterprise, and the wage economy) to buy equipment and supplies. The need for sustainable harvest levels and maintenance of critical habitats is shared with non-native subsistence and recreational harvesting, commercial harvesting, and wildlife-based tourism; and will be discussed following the review of those sectors. Linkages and interactions among subsistence harvesting, commercial harvesting sectors, and other uses of natural resources, will be discussed then as well.

Non-native subsistence and recreational harvesting

Country food

2.19 Non-native Yukoners harvest country food for recreation and to supplement their supply of store bought food. It is not easy to separate the two; and for the purpose of this paper it is not necessary. Non-native Yukoners probably get recreational enjoyment from their subsistence harvesting; and they generally eat what they harvest for sport. Data on the non-native country food harvest cover resident hunting of large mammals (big game), upland game birds and waterfowl; the domestic fishery; and the resident sport fishery; and are summarized in Table 2.4. The total average annual harvest is 242,111.5 kg (edible weight), or 12 kg per capita (based on a non-native population of 20,280 in 1985); with an estimated equivalent monetary value in 1985 dollars of $1.2 million a year*.

Note: * The figure of $5/kg is chosen by Yukon Dept of Economic Development: Mines and Small Business & Canada Dept of Indian and Northern Affairs (1986) to arrive at this estimate. The figure is calculated by weighting 1986 retail meat and fish prices with harvest proportions (using beef, chicken, coho and whitefish as the substitutes for big game, birds, all salmon, and all freshwater fish respectively); and adjusting for inflation. This figure is lower than the $9/kg used to estimate the monetary value of the native country food harvest, because prices are lower in Whitehorse and there is a greater proportion of higher-priced salmon in the native harvest.

Fishing accounts for 35% of the non-native country food supply; hunting for 65%. Among the hunted animals, large mammals (as for native subsistence, virtually entirely moose and caribou) account for 97% of the wild meat supply, birds providing 3% (however, there are no data on the non-native harvest of small mammals). Although significant, non-native harvest of country food is clearly much less important than the native harvest. It may also be declining. During the period 1980-1985, sales of angling licences to Yukon residents remained fairly steady--7,246 in 1980 and 7,277 in 1985 (Canada Dept of Fisheries and Oceans 1983; Yukon Dept of Renewable Resources data); but sales of hunting licences fell from 5,437 in 1982 to 4,499 in 1985 (Yukon Dept of Renewable Resources data).

Fuelwood

2.20 Based on cutting permits, the average annual fuelwood harvest by non-natives during 1981-1985 is estimated to be 34,339 cubic metres (Yukon Dept of Economic Development: Mines and Small Business & Canada Dept of Indian and Northern Affairs 1986). At the 1985 market price of $\$30/m^3$, the equivalent monetary value of this harvest would be about $1 million. Taken together, the non-native harvest of country food and fuelwood has an equivalent monetary value of $2.2 million a year; or about $109 per capita, based on a non-native population of 20,280.

Commercial harvesting

2.21 The three commercial harvesting sectors are: trapping; fishing; and forestry (logging and cone gathering).

2.22 The average annual production value (1981-1985) of the trapping sector is $1,214,000. Currently there are 700-750 licenced trappers, 500-600 of whom are status and non-status Indians. Trapping has strong links with native subsistence harvesting, providing harvesters with income to buy equipment and supplies. There are 377 registered traplines (parcels of land on which an individual is given exclusive rights to harvest furbearers); and five group areas (large traplines assigned to a native band)--Ross River, Burwash, Old Crow, Fort McPherson, and North Slope.

(Trapline registration was introduced in 1951.) (Yukon Department of Renewable Resources 1985a; H. Jessup pers. comm. 11 February 1987).

2.23 Five species (lynx, American marten, muskrat, wolverine, and red fox) account for 94% of the average annual value (1981-1985) of Yukon-produced furs (see Table 2.5). All are wild-caught. They illustrate some of the important features of commercial trapping. First, some furbearers are high value, low volume species (for example, only about 2,000 lynx were harvested annually but each pelt was worth more than $400). Others are the reverse, low in value but high in volume (eacl. muskrat pelt may have been worth only $3.50, but more than 13,000 of them were harvested). Second, some species are significant because they are dollar earners for a high proportion of trappers. The American marten is considered one such bread-and-butter species. Year in, year out, it figures significantly in Yukon fur harvests (H. Jessup pers. comm. 11 February 1987). The ease with which the marten is trapped, coupled with its high market value, has meant that it has provided one of the highest financial returns per unit effort of any Yukon furbearer (Archibald & Jessup 1984). By contrast, muskrat trapping is of significance largely to one group of trappers--the native people of Old Crow. The greatest concentration of muskrat in the Yukon occurs on Crow Flats and the spring hunt is part of the band's cultural and social tradition (Fuller & McTiernan 1986, Murphy 1986, Yukon Department of Renewable Resources 1985a). Third, the value of fur depends on many factors. Some are unpredictable and can cause dramatic fluctuations in the price obtained per pelt (the price of lynx more than doubled between 1980/81--$286 per pelt--and 1984/85 [$695 per pelt] due to its sudden emergence as a high fashion fur). Others are linked to desirable, intrinsic qualities of the fur which ensure a more consistent, steady market demand (for example, the thick fur of wolverine is rated 100, on a durability scale of 0 to 100) (Yukon Department of Renewable Resources 1985a). In general, the fur quality of species trapped in the Yukon is highly regarded by the fur industry. Especially singled out are lynx and marten. The territory produces the best lynx (not only are the hairs clearer--whiter--but also the animals are larger) and the second best marten (after those of the NWT's Mackenzie River Valley) (H. Jessup pers. comm. 11 February 1987).

2.24 In addition to fur sales, Yukon trappers earned in total an annual average (1982-1985) of $54,500 from the export of live furbearers. Most (98%) of this sum came from lynx ($25,875), wolverine ($18,500) and marten ($9,100) (Yukon Dept of Renewable Resources data). The Council for Yukon Indians and the Yukon Trappers Association are opposed to the export of live furbearers, on the grounds that the animals are likely to be used as breeding stock, and thus assist competition from fur farming outside the Yukon (Select Committee on Renewable Resources 1986). The practice has since been banned. The ban is contrary to the principle that genetic material should be shared, a principle on which Yukon agriculture (including fur and game farming) depends, since virtually all livestock breeds and crop varieties grown in the Yukon have been developed from non-Yukon genetic resources. Consequently, the issue deserves investigation (what is the market relationship between wild furs and farmed furs? do Yukon furs have a relatively secure market share due to their high quality? what are the implications of a ban for Yukon agriculture, aquaculture and silviculture?).

2.25 The trapping sector has potential for further development. Many traplines are underused; and value added could be increased by expanding local processing and greater use of Yukon furs in locally made products. Constraints on development include: difficulty in reassigning underused traplines to new trappers (also, many assistant trappers have difficulty obtaining exclusive rights to an area); cyclic fluctuations in lynx populations, complicating determination of sustainable harvest levels; the sensitivity of fur prices to sudden changes in fashion, public opinion, or the supply of furs from elsewhere; and the potential impact of the anti-harvest/animal protection movement*. There is also a need to ensure high standards of trapping methods and pelt preparation, to ensure that the harvest is as humane as possible, and to obtain premium prices (Select Committee on Renewable Resources 1986; YUKON 2000 Development Strategy Sectoral Report on Hunting, Trapping, Guiding).

Note: * The Minister for Renewable Resources has committed the Yukon Government to: (a) mounting an extensive counter-attack against the anti-trapping lobby, combining forces with other Canadian jurisdictions; (b) designing a Yukon programme, emphasizing Yukon conditions; (c) funding fur and trapping industry groups mounting counter-campaigns; (d) playing a central role in a pro-trapping campaign (Yukon Dept of Renewable Resources 1985b).

Commercial fishing

2.26 The average annual production value (1981-1985) of the fishing sector is $293,000. Anadromous species account for 94% of the value; freshwater species for the remaining 6% (see Table 2.6). Chinook salmon, the more important of the two anadromous species, is found in both the Yukon River basin and the Alsek-Tatshenshini system. Chum salmon is found primarily in the Yukon River drainage. Both species are taken largely in the Yukon River, mainly near Dawson and farther downstream.

2.27 Between 50% and 60% of the Yukon basin's chinook salmon stocks, and about 40% of its chum salmon stocks, are spawned in the Yukon; but the Yukon's share of the total in-river catch of chinook has averaged 9% in the 1980s (5% in the 1970s), and of chum 2% in the 1980s (1% in the 1970s) (Canada Dept of Fisheries and Oceans data). In addition to the Alaskan in-river catch, Yukon salmon are caught at sea by the American and Japanese fishing fleets. Treaty negotiations concerning the Yukon River salmon fishery are underway between Canada and the USA; but the Americans have indicated that they are unwilling to reduce their share of the catch. Instead, increased returns to the Yukon may have to come from reductions in the Japanese catch in the Bering Sea (Yukon Dept of Economic Development: Mines and Small Business & Canada Dept of Indian and Northern Affairs 1986). It will probably be necessary to reduce all catches of salmon, since Canadian and American biologists agree that the stocks are being overfished. For example, only 11,000 chinook reached Yukon spawning grounds in 1985, compared to the usual 20,000-30,000 and the target number of 55,000 (Canada Dept of Fisheries and Oceans unpublished report).Since 1980, in the interests of conservation, the number of commercial salmon licences has been limited, the annual average being around 44 (Pearse 1982; G. Zealand pers. comm. 13 February 1987).

2.28 Prior to 1981, there were no freezing or canning facilities in the Dawson area. Commercially caught salmon were sold dressed fresh or smoked, or kept for domestic purposes. This changed in 1981, with the opening of Han Fisheries Ltd., a largely native-owned fish processing company. The company processes about 50% of the commercial chinook catch.

and 60% of the commercial chum catch. Chinook is used almost exclusively for human consumption. Most (75%) of the chum is used as dog food (Environmental Protection Service & Canadian Resourcecon Ltd 1983; G. Zealand pers. comm. 13 February 1987).

2.29 Commercial fishing for freshwater species concentrates on lake trout and whitefish. About 90% of the whitefish is lake whitefish; the remaining 10% includes broad whitefish and round whitefish (G. Zealand pers. comm. 18 February 1987). Other freshwater fish that are caught commercially are burbot, suckers, northern pike, and inconnu. Commercial freshwater fishing is authorized on 20 lakes with a combined annual quota of 66,000 kg of whitefish and 33,000 kg of lake trout. Less than 10% of the total allowable catch was taken during 1981-1985 but the harvest is spread very unevenly over the various lakes, some being fished to their quota limits, others not (or hardly) at all. The number of commercial freshwater fishing licences varies greatly from year to year (for example, 111 licences were sold in 1982, and about half that number--59--in 1985). The commercial freshwater catch is taken primarily in March and April (to eliminate costs for boats and refrigeration); and is sold largely to the public, with only small quantities going to restaurants (YUKON 2000 Development Strategy: Sectoral Report on Fishing; Environmental Protection Service & Canadian Resourcecon Ltd 1983; Pearse 1982; Table 2.6).

2.30 The development potential of the salmon and freshwater fisheries is limited, due to a combination of the Yukon's unfavourable position as last in line for its own salmon, the inherently low productivity of Yukon waters (in common with northern waters in general), competition from other uses (of the resource: e.g. subsistence fishing and sport fishing; and of the habitat: e.g. placer mining); and product and market limitations. This last obstacle includes greater distance from the major markets for the same species than competing suppliers in the USA and southern Canada; and low market acceptability of Yukon salmon (the long migration upriver produces a dark, discoloured skin, with the result that Yukon salmon typically fetch their highest price as a lower grade of smoking fish) (Canada Dept of Fisheries and Oceans unpublished report). The future of the Yukon's commercial fishery appears to lie in supplying the local domestic and tourist market, while exploring opportunities for small-scale production of luxury items (Fox, Eyre & Mair 1983).

Forestry

2.31 About 20% of the Yukon's dimensional lumber needs are filled by the territory's own timber resources. The remaining 80% comes from British Columbia (J. Olynyk pers. comm. 10 February 1987). The average annual production value (1981-85) of the forestry sector is $1,730,000 (Table 2.7). During this period, the total volume of fibre produced in the Yukon increased, due to rising fuelwood and sawlog production (roundlog production was steady). The growing demand for fuelwood resulted as homeowners switched over to wood-based space heating. Personal gathering of fuelwood declined during the period, but commercial fuelwood suppliers increased their share of the market--from 42% in 1981 to 68% in 1985 (YUKON 2000 Development Strategy: Sectoral Report on Forestry; Yukon Department of Economic Development 1986). Virtually all fuelwood is fire-killed lodgepole pine, harvested close to the communities served (N. Denmark pers. comm. 18 February 1987). Currently 90% of the sawlogs produced in the Yukon are old growth white spruce, harvested primarily in the Watson Lake area but also elsewhere, wherever small sawmills are operating. Roundlog production depends on white spruce for housing timbers, and a mixture of conifers for the poles and timbers required by the mining industry (N. Denmark pers. comm. 18 February 1987). Essentially, therefore, the timber industry relies on lodgepole pine for fuelwood and white spruce for sawlogs and construction.

2.32 About 19% of the annual value of forestry in Yukon comes from lodgepole pine cone gathering for British Columbian seed processors. They, in turn, sell to Britain, France, Germany and Scandinavia. Lodgepole pine from north of 55° latitude is particularly important for plantation silviculture in Sweden (Lindgren 1983). Gathering pine cones provides part-time employment (September-October) for 15-25 persons; but demand is declining (Yukon Dept of Economic Development: Mines and Small Business & Canada Dept of Indian and Northern Affairs 1986).

2.33 Without a forest inventory, there is little reliable information on the extent and location of productive, economically accessible forest. The inventory for southeast Yukon is expected to be completed during 1987,

and for the entire territory within four years, provided funds continue to be made available. Little is known about natural rates of regeneration. The evidence from one site (Highland River) is that natural regeneration of spruce is 30% (at best) without site preparation, and 60-70% with site preparation (it should be 80%) (N. Denmark pers. comm. 18 February 1987). As noted (paragraph 2.31), the industry relies virtually entirely on old growth white spruce for sawlogs and house timbers. However, there is enough of this original forest remaining to last only another 10 years around Watson Lake and 15-20 years for the territory as a whole (assuming no expansion of the industry) (N. Denmark estimate 18 February 1987). It is estimated that a planting programme of one million trees a year for 10 years could successfully replant all of the logged over areas (N. Denmark pers. comm. 18 February 1987). These estimates suggest (a) the importance of delaying further expansion of the industry until a careful assessment (based on an up to date inventory) is made of the sustainable annual cut of economically accessible stands; (b) that, although the forest area of the Yukon is large, productive forest land is probably at a premium; (c) the genetic diversity of the main timber species will be an important resource, not only for seed production for export, but also for selection and breeding programmes in support of the plantation programme and silvicultural development. Genetic variation in Yukon lodgepole pine is known to be valuable; there may also be potentially valuable genetic variants of Yukon white spruce, black spruce, and subalpine fir.

Agriculture

2.34 Food imports are the second largest drain on the Yukon's economy (after oil imports) (YUKON 2000 Development Strategy: Sectoral Report on Agriculture and Food). Adverse climate and a lack of suitable land place severe constraints on conventional agriculture and its potential for expansion. During the two-year period 1984-1985, the average annual value of agricultural production in the Yukon was $1,500,000, of which crops accounted for 75% and livestock products for 25%. The farm industry is expanding. In 1985 there were 30 full-time and 75 part-time farmers (defined as persons who derive less than 50% of their income from farming) (Yukon Dept of Economic Development: Mines and Small Business & Canada Dept of Indian and Northern Affairs 1986).

2.35 Forage crops (largely brome) occupy most of the 1800 hectares under cultivation in the Yukon. Most of the territory's arable land is Class 5 (787,088 hectares), suitable only for fodder and forage and frost hardy vegetables. There are also 63,201 hectares of Class 3 and 4 land, on which a wider range of vegetables can be grown, as well as oats and barley. These are basically limited to three areas: Pelly Crossing-Carmacks (27,730 ha); Mayo-Stewart Crossing (24,380 ha); and Watson Lake (10,447 ha) (Table 2.8). There is no Class 1 or 2 land (Rostad, Kozak & Acton 1977). At present, most of the farming is done around Whitehorse, where three-quarters of the territory's population lives, and where there occurs the second largest continuous tract of Class 5 land in the Yukon (after Watson Lake) (Rostad, Kozak & Acton 1977).

2.36 Livestock enterprises in the Yukon should locate in areas with soils not only of high native grazing capability but also of high productivity for growing hay for winter feed. Land with good grazing potential has been identified in French Creek, Pelly River, Lake Laberge and Takhini burn areas (Rostad, Kozak & Acton 1977). Currently there are about 3,000 head of livestock in the territory--40 dairy cows, 500 beef cattle and 2,500 horses (Yukon Dept of Economic Development: Mines and Small Business & Canada Dept of Indian and Northern Affairs 1986). Grazing leases cover 14,750 hectares (P. Dribnenki pers. comm. 10 February 1987).

Tourism

2.37 Tourism earned $91.2 million in direct revenues in 1986. The Yukon's main attractions for tourism (the tourism "resource base") are the history of the mineral industry, especially gold; native culture and history; transportation history, notably riverboats; wilderness; scenery; wildlife; and special activities, such as hunting, fishing, and rockhounding. There are no data on the relative importance of these attractions to the major market segments of RV touring ($24.8 million), auto touring ($22.2 million), and bus touring ($17.6 million) (Yukon Dept of Tourism 1986). However, statistics have been compiled on three market segments--sport/trophy hunting, sport/trophy fishing, and "adventure travel"--that collectively

make up the wilderness/adventure travel industry. These three segments, together with portions of other market segments (such as auto touring) that are attracted primarily by the Yukon's wildlife and scenery, comprise what might be called the Yukon's wilderness and wildlife tourist industry.

Wilderness and wildlife tourism

2.38 Wilderness tourism is already much the largest of the revenue earning (non-subsistence) renewable resource sectors. Together, sport hunting, sport fishing, and "adventure travel" earned an estimated $7.5 million in direct revenues in 1986 (Table 2.9), and 8% of total tourist expenditures ($91.2 million). The sector is considered to have the potential of earning more than $12 million a year in direct revenues, most of the increase being expected from expansion of the "adventure travel" segment (Table 2.17; Yukon Dept of Tourism 1986). As part of YUKON 2000, the Dept of Tourism has adopted a Yukon Tourism Strategy that combines (a) encouragement of markets that provide the highest dollar returns, based on high daily expenditures and/or existing or potential market size*; and (b) maintenance of other existing markets**. The former include "adventure travel" and wilderness sport fishing; the latter include hunting and trophy sport fishing. All of these markets rely on maintenance of the wilderness character of the areas in which the industry operates. Other natural resource management implications of the Yukon Tourism Strategy (YUKON 2000 Development Strategy: Sectoral Report on Tourism) are:

Parks, wilderness areas, trails, campgrounds

1. Increased usage of all public sector attractions and facilities.

Notes: * Market segments selected for emphasis and special encouragement are: RV touring (independent); RV touring (fly/drive); bus touring (cruise/overnight); bus touring (fly/bus/foreign independent tour); sports conventions; sport fishing (wilderness); adventure travel.

** Market segments selected for maintenance are: auto touring (campers); auto touring (hotel/motel users); bus touring (overland); visiting friends & relatives; business; business/pleasure; sport fishing (trophy); hunting.

2. Need for:
a. increased roadside development;
b. more short trails near highways;
c. designation of wilderness recreation areas, park reserves or significant land mass;
d. management of wilderness zones;
e. data collection on campground and park use.

Renewable resource management

3. Need for:
f. more extensive fish management and stocking;
g. training and regulation of wilderness guides.

Interpretation

4. Need for:
h. development of materials designed to hold and retain;
i. training for interpretive programmes;
j. more and better interpretive materials (routes, geology, wildlife).

Crafts

5. Need for:
k. continued development of quality souvenirs and crafts;
l. training for craft production;
m. small business/crafts assistance programme.

Planning

6. Need for:
n. Regional plans that address tourism needs.
o. Community plans that acknowledge tourism.

2.39 There are 20 big game outfitters in the Yukon, serving some 500 clients from southern Canada, USA, Europe, and Japan. Non-resident hunters must be accompanied by one of these outfitters, each of whom has exclusive guiding and outfitting rights (of non-resident hunters) to a particular area. The main species sought are moose, grizzly bear, caribou, Dall's sheep, and black bear. Mountain goat, wolf, coyote, and wolverine are also hunted. Because of the limited number of trophy animals, sport hunting has little growth potential. However, it is likely to remain lucrative, with a high return per visitor/day ($800 [in 1986], compared with $248 for business/pleasure, the next highest market segment).

2.40 Sport fishing is hoped to have the potential of almost doubling (in direct revenues), which would bring it close to sport hunting in economic importance. The main species sought are lake trout, northern pike, Arctic

chinook salmon, and sockeye salmon. However, achievement of this potential will depend on careful distribution of fishing effort, and other measures to maintain the resource (see section on conservation issues, needs, and recommended actions). The larger and more readily achievable potential increase is likely to come from expansion of "adventure travel" (Table 2.17; Yukon Dept of Tourism 1986), and other non-harvest activities, such as wildlife watching. There are about 35 adventure travel guides in the Yukon, and several outside companies operate in the territory. They offer a variety of attractions, including canoeing, river rafting, wildlife viewing, cross country ski tours, photography, mountaineering, backpacking trips, and horseback riding.

2.41 The main challenge to the wilderness travel industry as a whole is to cooperate to ensure that the combined activities of hunting outfitters, sport fishing guides and lodges, and adventure travel guides are conducted in a manner that preserves the sense of wilderness that is their basic resource. The Select Committee on Renewable Resources (1986) concluded that there is plenty of room in the Yukon for both outfitting and wilderness guiding, "if some effort to cooperate and to avoid confrontation is made". It recommended:

a. Wilderness guides should be bona fide Yukon residents, who are certified that they have achieved particular standards, and licenced accordingly.

b. Outfitters of hunters and anglers should be bona fide Yukon residents. The regulations governing their operations should be tightened up and better enforced.

c. A training programme for all guiding and outfitting activities.

Energy

2.42 The Yukon is both energy producer and consumer, with consumption far outweighing production. Yukon residents and industry spent about $92 million in 1985 to meet their energy needs, of which about 80% (an estimated $74 million) was for imported refined petroleum products (Shaffer 1986). Total energy supply in 1985 is estimated to have been 6,090

terajoules (TJ = 10^{12} joules)*, of which 80% came from imported refined petroleum products (RPP), 14% came from Yukon-produced hydroelectricity, and 6% came from Yukon-produced fuelwood (Shaffer 1986).

Oil, gas, coal

2.43 Production of natural gas in the Yukon ceased in 1980, when 21.9 million cubic metres were produced (Brown & Caine 1986). Oil operations, however, continue to be conducted in offshore areas of the Beaufort Sea. Since the Yukon Act sets the territory's Beaufort Sea boundary at the low water mark, all of the offshore area falls, by default, within the Northwest Territories. Until boundary amendments and changes in federal policy regarding shared management and revenues of offshore oil development occur, the Yukon will obtain no economic benefit from Beaufort Sea oil (Thompson, Rueggeberg & Gifford 1986). A small amount of coal was mined to supply the energy needs of Cyprus Anvil Mine's mill, but production ceased with the shut-down of the lead-zinc mine (Yukon Dept of Economic Development: Mines and Small Business & Canada Dept of Indian and Northern Affairs 1986). In 1986, a small open pit coal mine was started near Ross River to supply the Curragh Resources Faro Mine mill. There are also reported to be 60,000 tonnes of proven coal reserves at the Whitehorse Coal property southwest of Whitehorse, which the company hopes to sell in Whitehorse (Canada Dept of Indian and Northern Affairs 1987). In 1978 (the only year when coal contributed to Yukon energy supply that has been analyzed), Yukon-produced coal accounted for 4% of the total energy supply (Shaffer 1986).

2.44 The Yukon's land-based reserves of natural gas, oil and propane are large (compared to the territory's annual energy demand). They could be cost-competitive, if developed with the very large non-Yukon reserves; but

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Note: * This is substantially lower than previous years (e.g. 7,892 TJ in 1982, and 9,310 in 1978), due to reduced mining acivity, and perhaps also to conservation measures (Shaffer 1986).

this is unlikely in the near future (Shaffer 1986). The contribution of the Yukon's coal deposits is likely to continue to be chiefly as a source of energy for the mineral industry. Assuming that industry activity returns to 1978 levels, the contribution of Yukon coal to the overall energy supply could be around 4-5%. Imported RPP will be by far the major source of energy, with the main prospects for reducing its contribution coming from conservation and from further development of hydroelectricity and wood.

Hydroelectricity

2.45 There are four hydroelectric facilities in the Yukon (Aishihik Dam, Mayo Lake, McIntyre Creek, and Whitehorse Rapids), with an installed capacity of almost 78 megawatts. The remainder of the territory's electricity supply comes from diesel generating facilities (with a capacity of about 43 megawatts). The Yukon's hydroelectric potential is estimated to be 11,000 megawatts (at a 60% capacity factor); but all recent studies agree that development of new major facilities is not warranted by likely foreseeable demand (Fox, Eyre & Mair 1983; Shaffer 1986; Yukon River Basin Committee 1984). Large-scale hydro development could be a risky investment, would create little long term employment, and could have serious impacts on other resources. Smaller scale hydro facilities and grid extension are likely to be the most appropriate and cost-effective means of meeting incremental increases in electricity demand or of replacing diesel generation (Shaffer 1986).

2.46 There is currently great interest in the development of mini- or micro-hydroelectric facilities (e.g. of 75 kilowatt capacity, suitable for a highway lodge/service station/restaurant complex). Although the initial costs would be high (e.g. $262,000), maintenance costs are estimated to be relatively low (e.g. $1,000 a year). The costs of such a micro-hydro facility over 20 years would be a third those of an equivalent diesel facility (DPA Group Inc 1986). Because of the high initial costs, the economics of micro-hydro depend heavily on site conditions (hydropower is a site-limited activity), secured long term demand for the electricity generated, and the availability of financing. Micro-hydro development also needs a less time-consuming (and therefore expensive) approval procedure, which currently is the same

as that required for large-scale projects. DPA Group Inc (1986) recommends a shortened, one-stop approval procedure for small hydro projects, instead of the presently separate procedure for water use licence, land lease, and land use permits.

Wood

2.47 Fuelwood consumption appears to have stabilized at between 80,000 and 90,000 cubic metres a year (native subsistence + non-native subsistence + commercial), apparently due to the inconvenience of handling, storage and use (Shaffer 1986). Refined petroleum products continue to provide the energy for about 60% of the space heating requirements of the residential sector and 80% of those of the commercial and institutional sector (at a cost of some $30 million a year). Thus there is considerable room to increase the use of wood in space heating. DPA Group Inc (1986) and Shaffer (1986) believe heating systems burning woodchips and wood waste have great potential for the commercial and institutional sector. Because these units operate at high temperatures they cause much less pollution than residential woodstoves (larger wood chip furnaces burn at a higher efficiency than oil furnaces). The Yukon forest industry uses as little as 40% of each tree for production, leaving up to 60% as waste. Disposing of this waste can cost operators up to $10 a ton (Resource Intertrade 1986; Yukon 2000 Development Strategy Sectoral Report on Forestry). This waste residue could be used to fuel wood burning furnaces: DPA Group Inc (1986) claims that the annual sustainable yield of wood waste has five times the heating capability of the volume of petroleum products now used. The main development need identified by DPA Group Inc is for government and industry commitment to use wood as the fuel for central heating.

Manufacturing

2.48 The manufacturing sector is included in this discussion because it is the main vehicle for increasing the value added of the natural resource producing sectors. It can also link different resource sectors in valuable ways, making each more productive. For example, development of the livestock sector requires (among other things) a slaughter house and meat

processing plant. These in turn would help make a tannery viable by providing a major source of raw materials. A tannery could also process fish skins (articles made of fish skin, such as wallets, purses and key-holders, sell well and could find a ready market among tourists)--which otherwise could not be made in the Yukon because the sustainable supply is small.

2.49 There is a demand for Yukon-made products, especially from tourists, as long as quality, reliability of supply, and competitive prices, can be maintained. Products in demand include crafts (such as snowshoes, freighter canoes, and ceramics) and jewelry (YUKON 2000 Development Strategy: Sectoral Report on Trades and Services); and other products that can be strongly identified with the Yukon's native and non-native traditions and environment (YUKON 2000 Development Strategy: Sectoral Report on Manufacturing). The Import Substitution Workshop (DPA Group Inc 1986) identified a large number of possible manufacturing and processing opportunities, from which it selected a short list of products that could be made locally from local resources:

a. Food products

   Smoked fish and other processed fish products
   Jams, jellies, honey

b. Feed and fertilizer (notably using fish)

c. Tanning products

   Leather, furs, skins
   Articles made of leather, fur or skin

d. Wood products

   Building materials
   Fence posts
   Furniture
   Specialty items (e.g. cutting boards, toys, mobiles)

e. Metal products (notably those designed for northern conditions)

   Sheet metal products
   Windows

f. Clay products

   Bricks
   Ceramics

2.50 Sawmillers need access to a dry kiln to enable production of kiln-dried and graded construction lumber, which at present has to be imported from British Columbia (Resource Intertrade 1986; YUKON 2000 Development Strategy: Sectoral Report on Forestry). Small-scale manufacturers need access to markets and probably assistance with marketing. They would also benefit from working closely with primary producers to assure adequate and timely supplies of raw materials. Industrial manufacturers, whose main Yukon markets are the territorial and federal governments, face a tendering system designed for southern Canadian conditions (excessively narrow specifications, and unrealistic tender and work completion deadlines) (DPA Group Inc 1986).

Conservation issues, needs, and recommended actions

2.51 This section brings together and summarizes the discussions and recommendations on conservation of:

a. The Select Committee on Renewable Resources (1986).

b. The YUKON 2000 Development Strategy Sectoral Reports on the Non-Wage Economy; Hunting, Trapping, Guiding; Fishing; Forestry; Agriculture and Food; and Tourism.

c. YUKON 2000 discussion papers; and reports of related consultations, such as the November 1986 Outfitters and Wilderness Operators Workshops.

The topics covered in this section are grouped into four subsections: wild animal harvest management; wild animal habitat maintenance; forest management; domesticated renewable resources (agriculture and aquaculture). These groups help to clarify relations among different resource users, particularly those users with overlapping interests. Each subsection begins by identifying the resource users primarily concerned. Linkages and relations with other resource users are covered at the end of each subsection.

Wild animal harvest management

2.52 Resource users primarily concerned: harvesters of wild animals--native subsistence harvesters; non-native subsistence and recreational harvesters;

commercial trappers; commercial fishers; outfitters and wilderness operators and their clients (tourists who hunt or fish).

2.53 In many areas of the Yukon, government has insufficient information on game species and the "ability of the environment to produce game" to identify sustainable harvest levels. Several wildlife populations have declined from historic levels; the reasons for these declines are not always clear. Attempts to allow such species to recover involve harvest restrictions and/or predator control programmes, and so are controversial. Controversy over the allocation of limited wildlife resources among different users is exacerbated when there is inadequate information on population numbers and dynamics (Sectoral Report on Hunting, Trapping, Guiding).

2.54 Populations of large mammals (big game) are variously reported to be generally healthy, but census data are incomplete and there are some problems (Yukon Dept of Renewable Resources 1985); or to have declined due to harvesting pressures and predation (Select Committee on Renewable Resources 1986). The annual non-native harvest of moose has declined from 743 in 1982 (680 in 1981) to 495 in 1985. This decrease (of 33% from 1982, 27% from 1981) is associated with a declining moose population and high calf mortality rates, primarily in southwest Yukon, due to heavy hunting pressure and high rates of predation. Recent field studies also show reason for concern about the woodland caribou herds (Yukon Dept of Renewable Resources 1985; Yukon Dept of Economic Development: Mines and Small Business & Canada Dept of Indian and Northern Affairs 1986). The harvesting pressures identified by the Select Committee are:

a. An increase in hunting activity in small concentrated areas close to large population centres.

b. Easier access to game through new roads and all-terrain vehicles.

c. Unregulated and unmonitored subsistence hunting.

d. Inadequate enforcement of hunting regulations.

2.55 The main problem concerning furbearer harvesting is the cyclic fluctuation in lynx populations, which (as noted in paragraph 2.25) complicates

determination of sustainable harvest levels. The Dept of Renewable Resources is reviewing the lynx harvest strategy and studying the effects of harvesting at low points of the population cycle. Lynx trapping regulations in the future will be based on this work (Yukon Dept of Renewable Resources 1985b). There are apparently no significant harvest problems with respect to small game mammals, upland birds, or waterfowl.

2.56 Concerning the effect of roads and ATVs, the Select Committee recommended:

a. Establishment of 2 kilometre no-hunting corridors (1 km on either side of the road) on all highways and major roads, except the Dempster Highway, which should have an 8 kilometre no-hunting corridor (4 km on either side of the road).

b. Although there should be no outright ban on ATVs (because they extend the range of the hunter, so helping to spread hunting pressure), there are two circumstances in which ATVs should be controlled: (1) ATVs and 4x4s should be banned in remote areas recently made accessible by new roads (wildlife populations in such areas are often concentrated and unwary; they can be easily and quickly reduced; the advantage to the hunter of an ATV is "excessive and unnecessary"); (2) ATVs and 4x4s should be restricted to designated and marked locations in areas of sensitive habitat.

2.57 Concerning subsistence, there appears to be wide agreement about the need for regulation and monitoring. "Current regulations provide little protection of the resource and its land base from competing uses...or ensure adequate management of species" (Sectoral Report on the Non-Wage Economy). The Council for Yukon Indians has stated that the bands "may be prepared to consider a cooperative reporting procedure to more accurately determine a baseline data system for big game in the Yukon. Although there is no obligation on our part to report, we recognize the importance of maintaining an integrated wildlife system for Yukon" (Select Committee on Renewable Resources 1986). The principles that should govern native subsistence havesting are (1) that it is an aboriginal right; and (2) that it should be sustainable. According to the first principle, the bands are the bodies that should decide who qualifies as a native subsistence harvester. According to the second principle, the bands should ensure that harvest levels are sustainable and should participate in the management of the harvested populations and their habitats.

2.58 The Select Committee recommended:

a. Subsistence should be defined by such factors as heritage, lifestyle, and economic necessity.

b. "Only those who truly 'qualify' as subsistence hunters, be they native or non-native, should be allowed this right".

c. All subsistence hunters should adhere to basic regulations respecting registration, harvest limits, and reporting of the harvest.

Because subsistence is an aboriginal right (principle 1 above), recommendations (a) and (b) should apply only to non-native subsistence hunters. But, in accordance with principle 2, recommendation (c) should apply to all subsistence harvesters, native and non-native alike. However, the procedures by which native harvesters register with the Dept of Renewable Resources and report their harvests need not be identical to those for non-native harvesters. For example, native harvesters could register with, and report to, a band conservation committee that would then provide the Department with the registrations and harvest reports. (This is a matter for discussion as part of the land claims negotiations.) Non-native harvesters register and report directly. The Minister for Renewable Resources must retain ultimate responsibility for the long term survival and health of the harvested populations. The setting of harvest limits should be done in a way that meets this requirement, respects aboriginal rights to full and effective participation in the management of the subsistence harvest, and includes all other users of the resource in the decision making process.

2.59 Allocation of harvested populations among the various harvesters is necessary when their combined harvest is above the sustainable level. There is a prevailing view that subsistence hunting should take priority over sport hunting and that resident sport hunters should have priority over non-residents (Select Committee on Renewable Resources 1986). The federal government allocates fish populations first to escapement (maintenance of the population), then the native fishery, and then either commercial, domestic (non-native subsistence) or sport fishing, depending on local conditions (Yukon Dept of Renewable Resources 1985b). If the principles proposed in chapter 1 are followed, priority would be as follows:

1. Maintenance of the harvested population.
2. Native subsistence harvest.
3. Non-native subsistence harvest.
4. Commercial harvest.
5. Recreational harvest.

Sport hunting by tourists is both a recreational harvest and a commercial harvest (bringing in more money [$4.2 million a year] than commercial trapping [$1.2 million] and commercial fishing [$0.3 million] combined). It may be appropriate, therefore, to treat sport hunting by non-residents as a commercial harvest rather than a recreational harvest, and to give it priority over sport hunting by residents--at least with respect to certain species that are major attractions for tourists (for example, grizzly bear) (Table 2.10). Such considerations suggest that the above allocation procedure should be applied strictly up to and including priority 3 (non-native subsistence harvest), but should be flexible concerning choices (a) between the commercial harvest and the recreational harvest; and (b) between resident recreational harvesting and non-resident recreational harvesting.

2.60 Information on the status and management needs of harvested fish populations, particularly freshwater fishes, is generally agreed to be extremely poor (Paish 1981; Pearse 1982; Select Committee on Renewable Resources 1986; YUKON 2000 Development Strategy: Sectoral Report on Fishing). The fragmentary evidence available suggests that stocks of the main freshwater species are declining. Lake trout and Arctic grayling seem to be the most seriously depleted, apparently due to overfishing (although habitat damage may be a contributing factor in some areas) (Pearse 1982). Yukoners point to declining stocks of native species, fewer trophy specimens, and too many "scavenger" fish, as indicators of overfishing by recreational anglers, excessive commercial fishing (both in the large southern lakes and in smaller remote lakes elsewhere in the territory), and increased damage to habitat (Select Committee on Renewable Resources 1986). As noted in paragraph 2.27, salmon stocks also have been overfished. In the Klukshu-Tatshenshini area, there is heavy competition for salmon between the native subsistence fishery and the recreational fishery

(Fox, Eyre & Mair 1983; Pearse 1982). Commercial fishing is competing with other lake fisheries, and is causing considerable concern, as indicated by a petition signed by more than 60 residents of the Carcross-Tagish area, calling for a stop to commercial netting on Bennett Lake (Select Committee on Renewable Resources 1986).

2.61 With respect to fisheries harvest management, the Select Committee and the YUKON 2000 Sectoral Report on Fishing recommended:

a. Prohibit fishing during spawning season, particularly on spawning beds.

b. Adopt more discriminating fishing regulations to take into account the conservation requirements of particular lakes and rivers.

c. Reduce commercial fishing of lakes.

d. Regulate fly-in fishing operations to control the number of operators using a particular lake, ensure operators maintain the stocks they harvest (e.g. by giving one operator priority status on a lake), and give resident anglers an equal share of the fish quota for each lake.

e. Remove "scavenger" fish. "Scavenger" fish such as white-fish and suckers have drastically increased their numbers throughout the Yukon at the expense of native sport fish. Harvesting programs to reduce their numbers, such as one proposed for the Bennett-Tagish Lake system to be under-taken jointly by the Carcross/Tagish Indian Band, Carcross Community Club, and the Department of Fisheries and Oceans, should be expanded" (Select Committee on Renew-able Resources 1986).

f. Promote conservation among resident and non-resident anglers by introducing a catch-and-release programme; making the fishing regulations synopses more promotional ("emphasizing small is beautiful and that the days of the really large trout are gone" [YUKON 2000 Sectoral Report on Fishing]); and licencing fishing derbies providing they focus on more than one species, encourage the use of barbless hooks, foster careful release of healthy fish in excess of the angler's needs, discourage the keeping of larger and more productive fish, and apply a portion of the proceeds to fish conservation and enhancement programmes.

g. Restock lakes and rivers near communities and close to highways. Native stocks (from the lake or river system concerned) only should be used for this purpose. Non-local stocks may be used to stock closed pothole lakes only.

2.62 Linkages and relations between harvesters and other resource users. There are two main concerns (habitat concerns are covered in the next subsection). First, disturbance of game animals, particularly by helicopters and other low-flying aircraft. Better enforcement of regulations is needed, but cannot do the job alone. There is also need for pilot education and adoption of a code of conduct that respects the sensitivity of animals to disturbance. The second concern is that hunting itself disturbs animals, causing them to avoid regularly hunted areas and so making them unavailable (in such areas) to wildlife watchers and wilderness tourists. To this extent harvesting and nonharvest uses of wildlife compete with each other for the same resource. This problem can be reduced by adopting high standards of hunting behaviour: minimizing noise and other disturbance associated with the hunt (this is in the interests of hunters, too, since it helps to make game more accessible and less wary). However, it may also be necessary to establish no-hunting areas at times or places important for wildlife watching. [A third linkage--between harvesting and roads associated with mineral exploration and development--is discussed in the habitat subsection below. See also paragraph 2.56.]

Wild animal habitat maintenance

2.63 Resource users primarily concerned:

a. Harvesters of wild animals--native subsistence harvesters; non-native subsistence and recreational harvesters; commercial trappers; commercial fishers; outfitters and wilderness operators and their clients (tourists who hunt or fish).

b. Wildlife watchers; wilderness "adventure travel" operators and their clients; other resident and non-resident nonharvest users of wildlife.

2.64 The necessity of habitat maintenance unites all of these resource users, many of whom depend on the same species (Tables 2.10 and 2.11). There are two needs: protection; and enhancement. Habitat protection itself has two distinct aspects: (1) protection from harvesting and other activities that disturb the animals at critical times but do not alter the habitats; (2) protection from activities that damage or destroy the habitats.

The first can be achieved by scheduling--prohibiting harvesting and other disturbances at the critical times concerned (e.g. no fishing on spawning beds during spawning). The second generally requires establishment of protected areas. It is important to keep these two aspects separate, because many Yukoners are concerned about "locking up land" in protected areas. It is not necessary to establish a protected area to protect animals from disturbance; and it is not necessary to prohibit harvesting in protected areas--unless harvesting is incompatible with other objectives (apart from critical habitat maintenance) of the protected area.

2.65 Habitat enhancement also has two aspects: (1) restoring degraded habitat to some original condition, better able to support a combination of numbers and variety of native species that prevailed at some earlier time; (2) stopping natural habitat change at a point that is favourable for a particular species or group of species. Cleaning garbage out of a stream is an example of the first. Controlled burning is an example of the second. The first type of habitat enhancement generally benefits all primary users (harvesters and nonharvesters) to some degree. The second type may benefit some at the expense of others, since it may involve destroying habitats essential for non-target species. For example, burning an area for moose could destroy climax forest essential for woodland caribou and marten.

2.66 The Select Committee on Renewable Resources recommended that the Government of Yukon develop policies and strategies for habitat protection, protected areas, and habitat enhancement, including identifying critical habitats and other environmentally sensitive areas requiring strict protection. This is being done by the Dept of Renewable Resources. Among the important habitat types to be considered are deepwater habitats (lakes and rivers for fish and waterfowl), wetlands (waterfowl, moose, muskrat), climax forest (woodland caribou, marten), and alpine and subalpine habitats (woodland caribou, Dall's sheep, grizzly bear, mountain goat).

2.67 Linkages and relations between primary users (harvesters and non-harvesters) and other resource users. Habitat enhancement by burning can affect timber production and agriculture. Habitat protection can limit the

activities of sectors that alter habitat: mining; logging and silviculture; agriculture; hydroelectricity; housing and roads. In turn these activities permanently destroy or temporarily damage habitats. Large-scale hydroelectric projects drown wetlands, spawning beds, and valley bottom lands. Agriculture can displace the habitats of furbearers, moose and waterfowl. Logging destroys the habitats of forest wildlife, although usually the effect is temporary (especially if logging is well managed). Mining exploration and development can destroy or degrade aquatic and other habitats, particularly if weakly regulated (e.g. poorly constructed and maintained mine tailings areas can contaminate surface and ground water).

2.68 Placer mining degrades and destroys fish habitat through: sedimentation and disturbance of spawning grounds (sediment levels above 25 mg/l greatly reduce egg survival of bottom spawning fish such as salmon, trout and char, and levels above 100 mg/l appear to be dangerous for broadcast spawners such as grayling and whitefish); contamination of feeding areas (high sediment loads obstruct the food supply of bottom feeding fish such as whitefish and burbot, and probably affect the feeding efficiency of salmon, trout, char and grayling); and interference with migration of salmon (including abrasion of skin and gills by suspended sediments). Downstream of most placer mines, sediment levels during sluicing are between 1,000 and 4,000 mg/l, suggesting that fish production and unregulated placer mining are incompatible. On that basis, it has been estimated that 10% of potential salmon production and 5% of potential freshwater fish production have been lost to placer mining (Environmental Protection Service & Canadian Resourcecon Ltd 1983). Regulations have been proposed that, among other environmental safeguards, would prohibit stream diversions and severely limit allowable sediment discharges on rivers or reaches that are most important for fish production (category A and B streams), imposing less stringent conditions on rivers or reaches that are less important for fish production (category C, D and X streams). These proposals have been strongly criticized by the Klondike Placer Miners Association, which believes they would put many placer miners out of business (estimates of the proportion of operators that would be forced to relocate or close down completely range from 16% to 85%).

2.69 The impacts on habitat of placer mining and hard rock mining (in their producing phase) are essentially of the same order as the impacts of agriculture and construction. They can eliminate habitats completely, but usually on a highly site-specific basis, affecting only a small proportion of the territory's total area. Regulation can limit impacts away from the site, but not much else. By contrast the exploration and development phases (especially the former) of the mineral industry have the potential to affect many habitats throughout most of the Yukon. The wilderness/adventure travel industry has expressed great concern over the extension of mining roads. The roads are used by 4x4s and ATVs to reach smaller trails and open wilderness areas, disrupting wildlife and their habitats and threatening the sense of wilderness. In addition, tractors and other heavy equipment have damaged or destroyed grazing areas used by big game outfitters and horseback-based wilderness operators. The mineral industry has pointed out that one of the effects of mining roads--increased hunting pressure as a result of better access--is incidental and basically a harvest management problem. It should be dealt with, not by restricting mining roads, but by improved regulation of harvesters. (The cost of providing the extra management should be included in any assessment of the benefits and costs of the mining operation concerned.)

2.70 Two other effects have to be dealt with in other ways. One is the harm that the roads and exploration/development activities can do to habitats, unless the roads are routed to avoid sensitive habitats and operators do their best not to cause undue disturbance. The extra costs of avoiding sensitive habitats could be paid for by government. (The Regional Resources Roads programme has been criticized by the wilderness travel industry as subsidizing destruction of their resource--paying the additional costs required to combine mineral development with maintenance of wildlife would seem to be a more widely acceptable application of this programme.) Operator behaviour could be self-regulated by the mineral industry, through a code of conduct developed with other interested parties (Council for Yukon Indians, Yukon Trappers Association, and the wilderness travel industry).

2.71 The other effect of mining roads and associated activities is to destroy the wilderness qualities of roadlessness and absence of obtrusive evidence of people. In this respect, the mineral and wilderness travel industries appear to be incompatible. However, following the principles proposed in Chapter 1, the first step should be to determine through consultation the extent to which wilderness character can be maintained sufficiently by appropriate routing and operational practices (including reclamation and rehabilitation of roadways as soon as they cease to be used for their original purpose); and what this would cost. The wilderness travel industry should then identify the areas that it considers to be of priority importance for their operations and whose wilderness qualities (and hence the viability of their operations) would be destroyed by the presence of a road. Only then can the extent and severity of incompatibility be judged, and only then should allocation take place between the two uses.

2.72 Forestry is the only other sector with potentially extensive impacts on wild animal habitats. Logging both physically removes habitat and causes ancillary habitat damage and wildlife disturbance (roads, equipment). This is probably only a minor and localized problem at present, because the sector is small; but timber production could have wide impacts if the industry were to expand without good habitat management. Fortunately, it is relatively easy to reconcile timber production and habitat maintenance by protecting riparian strips of forest on either side of streams, and by logging according to the island rotation system (leaving islands of mature forest permanently unlogged, and rotating annual cuts around the islands in combinations of slices [like cutting a cake] that produce a mixture of stands of different age and structure as the forest regenerates).

Forest management

2.73 Resource users primarily concerned: commercial loggers (including commercial fuelwood cutters); cone gatherers; native and non-native subsistence fuelwood harvesters.

2.74 The forest is the resource of the primary users listed above; the habitat (resource base) of subsistence harvesting, commercial harvesting,

recreation and tourism; and the source of ecological services that benefit all Yukoners, such as watershed protection and soil and water conservation. It needs to be managed for all these values. As noted in paragraph 2.33, productive forest land is probably at a premium in the Yukon. A reliable forest inventory, sustainable cutting levels, and good regeneration and stand management, are all essential for a productive and sustainable forest industry. Achieving this in combination with maintenance of the habitats of harvested animals and safeguarding other values is feasible, as long as provided for by forest policy and management plans (both lacking at present).

2.75 Submissions to the Select Committee on Renewable Resources urged that clear cutting be avoided. But clear cutting may often be necessary for the genetic health of the stands for successful long term regeneration and survival. Selective cutting often removes the best (tallest, straightest, fastest growing) individuals from a stand, leaving reproduction to trees that have been rejected because they are small, diseased or misshapen. Clear cutting in relatively small blocks (a) maintains the genetic integrity of the harvested population; (b) can be harmonized with landscape aesthetics (it will not result in large areas of devastation, as found in parts of British Columbia, which is what Yukoners are anxious to avoid); and (c) is compatible with maintenance of wildlife habitats.

2.76 As noted earlier (paragraph 2.33), it is important to maintain the genetic diversity (especially the main genetic variants) of the major timber species, to ensure the availability of well adapted, high yielding trees to provide for both adequate stand regeneration and plantation silviculture. Genetic resource maintenance areas may be established on timber producing lands (that is, logging does not have to cease to protect forest genetic resources) and in protected areas where logging is not allowed (that is, protected areas can make a significant contribution to timber production simply by maintaining valuable gene pools). In either case, it is important that genetic resource maintenance is identified as the primary management objective. When combined with logging, care must be taken to ensure adequate production, collection, documentation and storage of seed before felling, and adequate subsequent regeneration with seed from the stand

concerned. When included in a protected area, provision should be made to permit seed collection. As recommended by the Select Committee on Renewable Resources, wherever pine cones are gathered they should be harvested in ways that do not involve cutting down the entire tree (e.g. by cutting specific branches).

2.77 Linkages and relations between primary users (commercial) loggers and cone gatherers and subsistence fuelwood cutters) and other resource users. The main linkages have been covered already, except for relations with agriculture. Agriculture and forestry compete with each other for productive land. Land that is marginal for agricultural crops (class 5 cropland) may not be marginal for timber production--and timber production on such land may be the better (sustainably productive) use. Competition between the two sectors may be avoided, if they are separated geographically--for example, by emphasizing timber production in the Watson Lake region and livestock grazing in the Whitehorse region. The practical scope for geographical separation has yet to be determined. In addition, the Select Committee on Renewable Resources has recommended:

a. Prior to land being cleared for agriculture, mining or other purposes, any marketable timber should be harvested. "The Government of Yukon must take the initiative in this regard when constructing new roads and accesses."

b. A woodlot management policy should be introduced, to improve harvest and management practices (e.g. harvesting fuelwood by thinning out fire-killed areas would improve wildlife habitat).

Domesticated renewable resources

2.78 Resource users primarily concerned: farmers and other producers of domesticated plants and animals (agriculture [crop growing and livestock raising, including fur farming and game farming], aquaculture, and plantation silviculture).

2.79 Producers of domesticated renewable resources depend on areas of land or water of restricted availability in the Yukon. The most suitable land for agricultural crop production is limited to very small areas around

Dawson, Faro and Ross River, and somewhat larger areas around Mayo, Stewart Crossing, Pelly Crossing, Carmacks and Watson Lake; and the most suitable land for livestock production is around Dawson, Pelly Crossing, and the Haines Junction/Whitehorse/Carcross regions (Table 2.86). These are also probably the areas most suitable for plantation silviculture. Aquaculture has to be conducted in economically accessible pothole lakes or other water bodies that are isolated from indigenous fish populations. It is necessary to maintain enough of this land/water base to meet likely production needs (determined by the economically feasible potential for import substitution [Yukon sales] and exports).

2.80 With respect to agriculture, the Yukon Livestock and Agricultural Association estimates that roughly 32,650 hectares of land are needed to grow the amount of food consumed by Yukoners. This is about half of the total area of agroclimatic (crop) classes 3 + 4 land, but only 4% of the combined area of classes 3 + 4 + 5 land. The land supply appears to be ample, but account should be taken of the potential demand for silviculture, and of the very limited proportion of the best land for crop growing for which there is not competition from other resource users. Consequently it would be prudent to minimize the loss of class 3 and 4 land to buildings and infrastructure. As a general rule, housing subdivisions should not be built on class 3 and 4 land.

2.81 It is also important to maintain indigenous genetic materials and have ready access to non-indigenous genetic materials. Crop varieties and livestock breeds are the raw materials of agriculture--all of the Yukon's come from outside, apart from some of the breeding stock for game farming. All domesticated renewable resource production (agriculture, aquaculture, and plantation silviculture) depends on national and international cooperative systems of conservation and exchange of genetic resources--and the Yukon is no exception. Yukon itself has valuable genetic resources, among furbearers, game animals, and probably native fish populations, that could be used in the development of new livestock breeds and aquaculture strains in the Yukon and elsewhere; and indigenous plants with potential as new or improved forage and fodder crops, tree crops, landscaping and ornamental crops, and food crops (such as berries).

2.82 Linkages and relations between domesticated renewable resource sectors and other resource users. The relationship between domesticated renewable resource sectors and harvesters and other users of wildlife is more complex than might at first appear. On the one hand, agriculture/silviculture compete with wildlife users for physical space and hence for wildlife habitat. On the other hand, they rely in part on wildlife habitat for genetic resources, as well as for such ecological services as water supply and flood protection (through storage by lakes and wetlands).

2.83 The domesticated resource sectors would also benefit from protection of representative examples of the main ecosystems (natural environments) of the Yukon, as reference sites for baseline monitoring and related scientific research on productivity, regeneration, and adaptation to environmental change. One of the requirements for rapid and sustainable development of agriculture and silviculture is reliable information on the effects of different management systems on soils, hydrology and surrounding habitats over many years. This is particularly important in regions (such as the Yukon) that are on the frontiers of domesticated resource production, where experimentation is needed to find out the most appropriate crops, livestock breeds, and management practices. The experimental approach depends on good background data on natural conditions and natural changes--and such data are obtainable only from sites with the same original vegetation as formerly grew on the land being farmed. Areas set aside as research reference sites could serve other purposes as well, as long as they did not involve changes to the area's soils, hydrology or vegetation (e.g. hunting, trapping, and habitat maintenance could be compatible uses).

Major compatibilities and incompatibilities

2.84 The previous section was organized so as to illustrate a basic but overlooked fact about land use. The various uses of wildlands or natural habitats are the only practicable form of "multiple use", in the strict sense of the term. These uses include native subsistence harvesting, non-native subsistence and recreational harvesting, commercial trapping, commercial fishing, commercial forestry (logging and cone gathering), sport hunting,

sport fishing, and wildlife watching and other nonharvest uses of wildlife and wilderness. With care, cooperation and good management, the same area can support the development and conservation needs of all these different uses. In short, all are potentially compatible. They are also compatible with supporting many of the conservation needs of other resource uses: lakes and wetlands provide the water storage needed to help protect downstream settlements from floods and to regulate flow for small-scale hydroelectric facilities. Forests and wildlife supply some of the genetic resources used by agriculture and many of the genetic resources used by plantation silviculture. The conservation requirements of all renewable resource sectors are thus potentially compatible with each other, as well as with development of the wild renewable resource sectors.

2.85 However, areas required for development of the domesticated renewable resource sectors (rather than for conservation of their genetic and ecological support systems) are essentially single use areas. This is because agriculture, aquaculture and plantation silviculture involve either complete removal of the natural habitat or its intensive manipulation, which (in terms of wild renewable resource uses) amounts to the same. (Each domesticated renewable resource sector is also basically incompatible with the others, except in combined agri-silvicultural and agri-aquacultural operations.) Similarly, nonrenewable resource developments (such as mines), and housing and other built areas and infrastructure, involve complete (or virtually complete) alteration of the natural habitat; and the sites where they occur are effectively single use sites.

2.86 Following principle c (page 7), we begin by identifying potentially compatible natural resource uses; and following principle d (page 7), we consider the development benefits together with the measures required to maintain them (conservation):

a. All harvesting of wild animals (native subsistence harvesting, non-native subsistence and recreational harvesting, commercial trapping, commercial fishing, and hunting and fishing by tourists) is compatible provided--(1) the wild animal populations concerned can sustain the combined harvest; (2) where they cannot, a management system is in place that can reduce the harvest to a sustainable level,

and (in the event of competition among harvesters) allocate the resource according to the priorities proposed under principle f (page 8), as modified in paragraph 2.59:

1. maintenance of the harvested population;

2. native subsistence harvest;

3. non-native subsistence harvest;

4. either commercial harvest, or residential recreational harvest, or non-residential recreational harvest, depending on local conditions.

b. There are three obstacles to taking advantage of the above compatibilities: (1) lack of information about harvest levels, particularly native harvest levels; (2) lack of information on the status and trends of harvested populations, and hence on which harvest levels would be sustainable; (3) lack of a management system applicable to all harvesters (native and non-native), and hence inability to meet the second of the two provisos above. The information obstacles (1 & 2) are considered later in this chapter. The management obstacle (3) is considered in the next chapter.

c. Maintenance of the wild animal habitats that are the resource base both of the various harvesters listed in subparagraph a above and of nonharvest users of wildlife and wilderness (1) can be combined with maintenance of wild genetic resources needed for aquaculture, silviculture, and agricultural crop and livestock production (including fur farming, game farming, and the commercial domestication of indigenous plants and animals); (2) can be combined with maintenance of the ecological support systems of agriculture, settlements, and small-scale hydroelectricity (e.g. forests that protect watersheds and wetlands that store water); and (3) is potentially compatible with timber production, provided a management system is in place that ensures harvests are sustainable and that logging practices and rotations are along the lines described in paragraph 2.72.

d. There are two obstacles to integrating maintenance of wild animal habitats, genetic support systems and ecological support systems, and of doing so in ways compatible with timber production: (1) lack of a system for integrated habitat maintenance (including lack of information on critical habitats and support systems); (2) lack of the required forest management system. Both obstacles will be considered in the next chapter.

e. Mineral exploration is potentially compatible with all categories of harvesting wild animals (as listed in subparagraph a) and plants (forestry), as well as maintenance of their habitats, provided--(1) a management system is in place to

regulate any increase in harvesting pressure that may result; (2) measures are taken to ensure that exploration/development roads and activities avoid sensitive habitats and do not cause undue disturbance of wildlife, in accordance with principle b (page 6) to retain options by careful location and management of land and water uses; (3) small and unique sites that could be destroyed by exploration activities (e.g. the habitat of a plant or animal found only in the Yukon) are identified and protected.

f. None of the requirements to take advantage of this compatibility exists. All three are considered in the next chapter.

2.87 The major incompatibilities among resource uses, requiring allocation and scheduling (according to principles e and f, pages 7-8), are:

a. Between one use of wild renewable resources and another--between hunting and some nonharvest recreational uses of wild animals. Potential competition for space between big game outfitters and wilderness "adventure travel" operators can largely be avoided by scheduling and allocation by the outfitters and wilderness operators themselves (wilderness travel generally is winding down when sport hunting is starting up; and the former focusses mostly on river valleys whereas the latter concentrates on subalpine and alpine areas). The main concern is competition between hunting (whether for subsistence or for recreation) and road-based wildlife watching. Some of this competition can be reduced by higher standards of hunting behaviour (paragraph 2.62). However, it may also be necessary to establish no-hunting areas at certain places (and/or times) important for wildlife watching. On the basis of the priorities proposed under principle f (page 8)--subsistence uses before other uses, economically major before economically minor uses, uses with strong cultural values over uses with weak cultural values, an existing use before a new use--hunting (especially subsistence hunting) would usually take precedence over wildlife watching (the two uses are equally site-limited). However, following principle a (page 6), wildlife watching must be given a place to operate. One way of achieving this would be to provide hunters with a stake in tourism enterprises based on wildlife watching.

b. Between uses of wild renewable resources and uses of domesticated renewable resources--between conversion of land to agriculture (or, eventually, silviculture) and maintenance of wild animal habitats. On the basis of the priorities proposed under principle f (page 8)--subsistence uses before other uses, economically major before economically minor uses, uses with strong cultural values over uses with weak cultural values, an existing before a new use--wildlife would usually take precedence over agriculture. The com-

bined economic contributions of native subsistence harvesting + non-native subsistence and recreational harvesting + commercial trapping + the non-wilderness element of wildlife-based recreation and tourism (the likely locations of agriculture minimize competition with wilderness tourism) greatly exceed the economic potential of agriculture, even assuming optimistic levels of import substitution. In addition (where habitats important for subsistence are concerned), it would make little sense to increase the capacity for import substitution by reducing the capacity for subsistence. Subsistence and commercial trapping also have greater cultural significance than agriculture, and are the senior uses. However, (1) agriculture does have significant potential for import substitution and income generation, which, with care, almost certainly can be achieved without significant competition with subsistence; (2) in some cases, agriculture may be more site-limited than uses of wildlife, and so should have priority; and (3) following principle a (page 6), agriculture must be given a place to operate. In a draft report (to the Dept of Renewable Resources) on competing interests on agricultural land, Loeks (1987) has proposed a procedure for allocating land to agriculture that would achieve an appropriate (fair, consistent, non-arbitrary) balance among the above considerations. Land of class 3 agroclimatic capability would be allocated to agriculture, unless it would displace a critical wildlife habitat that is even more rare than class 3 land in the Yukon. Land of class 4 or class 5 agroclimatic capability would be allocated to wild renewable resource uses, if it had high value for any combination of wild renewable resource uses (subsistence, commercial trapping, forestry, recreation). If not, the land would be allocated to agriculture, unless it were highly used by any other resource group or it had high potential value for any other resource sector, and public (local community [to be consistent with principle g, page 10]) input indicated a strong preference for the other uses. (It is not clear why class 4 land is treated with class 5 rather than class 3 land.)

c. Between one use of domesticated renewable resources and another--between agriculture and plantation silviculture. As noted in pargraph 2.77, agriculture and forestry compete with each other for productive land. A sustainable forest industry is likely to rely on a combination of natural regeneration and artificial regeneration. The latter (especially if it includes intensive management) is likely to be cost-effective only if conducted on land that is also suitable for agriculture (classes 3-5). Both uses are equally site-limited and may have about equal potential for import substitution and employment and income generation. They are roughly equal with respect to all of the priorities proposed under the principle f (page 8). It would be consistent with principle g (page 10) to leave the choice to the communities concerned.

d. Between uses of renewable resources and uses of nonrenewable resources--

1. Between wilderness-dependent uses and the mineral industry. The essence of this competition is outlined in paragraph 2.71, with a proposed procedure for reducing competition as far as possible. It is obviously essential that this procedure be followed, because allocation of land to wilderness-dependent uses (together with any compatible uses) is tantamount to excluding the mineral industry from large tracts of land (it is already excluded from Kluane and North Yukon National Parks). The economic contribution of the mineral industry is so much greater than that of the wilderness travel industry, and wilderness uses are generally so exclusive of other uses, that the economic priority would tend to outweigh the other relevant priorities proposed under principle f (page 8), notably uses of renewable resources before uses of nonrenewable resources. Following principle a (page 6) wilderness-dependent uses must be given a place to operate. The mineral industry argues that Kluane and North Yukon are two such places and are more than enough. However, big game outfitters are excluded from national parks. The wilderness travel industry needs wilderness areas where big game outfitting is allowed. In one or more such areas mining activity may be incompatible. Such areas should be as few as possible; and their importance to all segments of the wilderness travel industry should be very strong, as should the case for excluding the mineral industry.

2. Between other uses of wild renewable resources (subsistence harvesting, commercial harvesting, road-based [non-wilderness-dependent] recreational harvesting and wildlife watching, ecological support [e.g. wetlands and watershed forests], and genetic support [e.g. genetic resources for agriculture]) and the mineral industry (producing phase). Producing mines and their infrastructure completely displace habitats important for the above uses, and hence are incompatible with them in places where they occur. Placer mining is superior to competing uses (native subsistence fishing, non-native subsistence and recreational fishing, fishing by tourists, and maintenance of aquatic genetic resources) with respect to one of the principle f (page 8) priorities (economically major before economically minor uses), inferior with respect to another (renewable resource uses before nonrenewable resource uses), and about

equal with respect to the remaining priorities. One option might be to allocate to placer mining streams that are major for placer mining and minor for aquatic renewable resources; to aquatic resources streams that are major for aquatic renewable resources and minor for placer mining; and to aquatic renewable resources streams that are major to both, with placer mining permitted subject to stringent regulations.

Hard rock mining is also economically superior to the competing uses, but it is not so important culturally. It (like placer mining) is as site-limited as the wild renewable resource uses, perhaps more so. Generally, hard rock mining should take precedence over uses of wild renewable resources (because of its economic superiority and because sites for economically productive mines are so limited), unless the site concerned is extremely important for subsistence and/or a major combination of wild renewable resource uses, and provided measures are taken to minimize harmful impacts downstream and on surrounding habitats.

Downstream impacts of mineral production (e.g. pollution) may be widespread, but can be avoided (or reduced to acceptable levels) by regulation. Regulations may have the effect of making marginal operations uneconomic, in which case the options are (i) close down, relocate, or don't start, the operation; (ii) allow the pollution and any consequential damage to wild animal habitats and populations; (iii) the public pays the costs of having both the operation and healthy resources and habitats downstream by covering the additional costs of regulation.

3. Between domesticated renewable resource uses and the mineral industry (producing phase). This type of incompatibility may not occur, except potentially between agriculture and hard rock mining. Mining would take priority over agriculture on virtually all counts (principle f, page 8), but (as noted earlier) agriculture must be given a place to operate. Land of class 3 (and class 4?) agroclimatic capability that has been allocated to agriculture, following the procedure proposed in subparagraph b above, should remain as farmland. Mineral production could displace agriculture on other land.

Major implications for the Yukon economy

2.88 It would be foolish to try to predict the overall effect of the proposed principles on the Yukon economy, just as it would be to try to predict the overall effect of sticking to the status quo. This is due partly to the frailty of all prediction; and partly to the fact that the Yukon economy is a small part of the Canadian and world economies, whose fluctuations could well mask any influence of natural resources management according to these principles.

2.89 It is clear from the socioeconomic goals and natural resources management objectives (chapter 1) that Yukoners should pursue three economic strategies:

1. Live off the land (= maintenance of the subsistence economy).
2. Pay less (= import substitution).
3. Earn more (= income and employment generation).

Taken to its limit each one of these strategies will prevent achievement of the others. The aim is to achieve an optimum combination of all three. It is fair to claim that this is possible only if natural resources are managed according to the proposed principles (or very similar ones).

2.90 The major implications for the Yukon economy of achieving this tripartite strategy would probably be: (a) acknowledgement of, and better support for the subsistence economy--especially native subsistence--including maintenance of the resource base on which it depends; (b) increased import substitution, through an orderly development of agriculture, timber production and silviculture, commercial harvesting, and the manufacturing and energy sectors; (c) more stable and diversified (and, it is hoped, increased) income and employment generation, with the mineral industry still the biggest income earner of the natural resource sectors, a major tourism industry, and significant contributions from the sectors listed under (b) above.

2.91 Achieving this strategy will depend heavily on two factors that relate to principles g and h (pages 10-11: give Yukoners control; and provide adequate information). First, greater awareness among all Yukoners of the diversity of interests that have to be accommodated, and a genuine desire to accommodate them. The strategy is a balancing act, and balancing acts are impossible if one or two groups keep shaking the wire. Combining all of the various uses of natural resources in the Yukon calls for a cooperative approach among all concerned. This in turn calls for mutual education about each other's needs, concerns and values. The consultations with bands, communities, and user groups, associated with YUKON 2000 and the Yukon Conservation Strategy, provide invaluable opportunities for this mutual education.

2.92 The second factor is the need for information. Taking advantage of compatibilities among uses, allocating and scheduling incompatible uses, and avoiding or limiting competition among users, require information. We have already noted the obstacles raised by lack of information on native harvest levels, the status and trends of harvested populations, and on critical habitats and support systems (page 51). Other information needs are indicated on page 10. Getting this information takes time and money, and there is justifiable concern among Yukoners over what kinds of information are needed and how much information is enough. Answering these questions depends on a more detailed review than is possible in this paper; but which will be done (with respect to renewable resources) as part of the Yukon Conservation Strategy.

3. RESOLVING COMPETING RESOURCE DEMANDS

3.01 This chapter proposes mechanisms to increase compatibilities among uses, address incompatibilities, and resolve competing resource demands. The first three sections identify mechanisms that enable different uses and users to coexist, and so reduce the need for allocation among uses: renewable resource management systems; siting and operating standards and regulations; and combinations of development, conservation, and increasing the resource base. The next two sections consider allocation mechanisms: environment and development planning; and socioeconomic and environmental impact assessment. Finally, there are sections on a framework and structures for implementing these mechanisms: cross-sectoral policy; consultative procedures; and regional resource planning and management councils.

Renewable resource management systems

3.02 Four complementary renewable resource management systems are needed:

a. A harvest management system.
b. A system of integrated habitat maintenance.
c. A forest management system.
d. A protected area system.

3.03 The harvest management system should cover all harvested animal species, and should be extendable to all harvested plant species except trees (to be covered by the forest management system), should any harvested plant (e.g. for fruit) eventually require management. It should be applicable to all harvesters, native and non-native. It should be designed to collect information on wildlife populations and their habitats, and numbers harvested; to set harvest limits to ensure they are sustainable; and, where necessary, to allocate the harvest. It should have the capacity (in terms of mandate, money, and trained personnel) to educate harvesters (e.g. in conservation practices and high standards of hunting behaviour) and to enforce its regulations (including regulation of any increase in harvest pressure resulting from, e.g., mining roads).

3.04 A system of integrated habitat maintenance means a system that combines maintenance of wild animal habitats, genetic resources, and ecological support systems--as outlined in paragraph 2.86 c & d. An area important as habitat for (say) moose may also be important as habitat for other harvested animals, for a genetically valuable plant population, and/or for flood storage or watershed protection. Identifying and maintaining areas that fulfil these various mutually compatible functions would mean that (a) a better, more comprehensive job is being done of maintaining valuable resources; and (b) less space is being taken up to do it (since the system is designed to maintain habitats that support more than one resource).

3.05 The goals of the forest management system should recognize that the forest is both the resource of the timber industry and the habitat (resource base and support system) of many other resource users, including society at large. It should ensure cutting allocations are sustainable, logging practices and rotations are compatible with maintenance of wild animal habitats, and regeneration (including survival to economic maturity) is at a rate that at least replaces the harvest (and preferably enables recovery from earlier harvests).

3.06 A protected area system is needed to maintain representative ecosystems (for reasons given in paragraph 2.83); rare and unique ecosystems, species, and genetic variants (including small and unique sites that could be destroyed by, e.g., exploration activities); and to provide for certain particularly site-limited uses of renewable resources, notably wildlife watching and wilderness recreation. The protected area system should be coordinated with that for habitat maintenance.

Siting and operating standards and regulations

3.07 Siting and operations of mining, industry, agriculture, and other activities that are potential sources of pollution or of disturbance of wildlife, should be regulated to prevent damage to human health and contamination of the habitats (or excessive disturbance) of threatened, unique or socioeconomically significant species and populations. Special attention should be paid to substances that are highly toxic, or are released in

large quantities, or persist in the environment and accumulate in living organisms. The impacts of such substances on the organisms concerned should be monitored, regularly evaluated, and reduced to levels that can be tolerated by them. Regulation should be proportionate to risk: activities that are located where risks to people or to sensitive organisms and their habitats are high should be obliged to operate to higher standards than activities where the risks are low (and vice versa).

3.08 As far as possible, standards and practices intended to avoid undue pollution, disturbance of wildlife, and damage to habitats, should be achieved through codes of conduct and similar mechanisms controlled by the sector concerned. Such codes of conduct would have to be developed with other interested parties (particularly, the affected interests); but otherwise the industry/sector concerned should be self-regulated. Self-regulation enables the industry to work out and achieve the most cost-effective ways of meeting the necessary standards. It makes it worth the industry's while to commit itself to educating its membership on high operating standards and why they are necessary (which in the long term is more effective than externally imposed regulations); and it promotes a spirit of cooperation among different resource users. Regulation by government should be introduced only when self-regulation is shown to be impractical or inadequate.

Combining development with conservation, and increasing the resource base

3.09 Research and development (R & D) is likely to have a mixed impact on the management of natural resources. Mining exploration and producing technologies can be expected to improve, with the results that more wealth could be obtained from existing sites, sites presently considered uneconomic could become economic, and currently undeveloped areas could be developed. This would increase interactions between the mineral industry and other resource users, and so increase the need for mechanisms to resolve competing resource demands. Similarly, the effect of R & D on renewable resource sectors could be to increase the range and value of uses made of the Yukon's plants and animals and add to the importance of maintaining the territory's diversity and productivity. This, too, would

increase interactions among resource users, and enhance the need for co-operative resource management.

3.10 With respect to renewable resources, however, R & D could increase the productivity of the resource base, and the renewability of particular renewable resources. For example, domestication of indigenous species could enable higher sustainable yields than are obtainable from the wild populations; and silvicultural and aquacultural technologies could be developed that would increase the productivity and sustainable yields from the Yukon's forests and water bodies. This would mean more money from the same area, or a smaller area required to generate the same amount of income--which could have the effect of taking pressure off the resource base and reducing competition among users.

3.11 The sustainable economic benefit of a resource sector and/or its compatibility with other resource sectors can be increased by combining development with conservation at the project level. For example, a mining operation could be designed from the development phase onwards to minimize harmful effects on nearby wildlife and habitats. By anticipating such effects and avoiding them at the design stage, the costs (to the industry and to renewable resource users) of achieving coexistence between the mine and the renewable resources might be significantly reduced. Development components can be added to conservation projects to provide income and employment to people who have had to limit their take of renewable resources as a result of the conservation project: an example would be the suggestion (paragraph 2.87 a) to provide hunters with a stake in tourism enterprises based on wildlife watching in areas where hunting has been restricted. By the same token, conservation components can be added to development projects to ensure renewal of the resources required for the project and/or compatibility of the project with other uses of renewable resources: an example would be maintaining valuable variants (e.g. high yielding forms, specially adapted forms) of indigenous plants domesticated for new commercial uses (e.g. indigenous grasses and other ornamental plants currently being domesticated to provide a local source of landscaping and reclamation materials).

Environment and development planning

3.12 Environment and development planning--or land-use planning--is the principal mechanism for allocating competing resource uses. At present, planning responsibilities in the Yukon are divided among the Northern Land Use Planning Directorate of DIAND (territorial and regional planning), the Yukon Dept of Renewable Resources (subregional planning), the Yukon Dept of Community and Transportation Services (district planning, and community planning for unorganized communities), and the municipalities (community planning for organized communities). Planning at the subregional and higher levels focusses on resources. Planning at the district and lower levels focusses on the settlements concerned. Most of the major resource allocation questions have to be sorted out at the higher planning levels before they can be fine-tuned at the lower levels. However, there has been no recent land-use planning at all at any of the higher levels.

3.13 Regional planning, which is crucial for resolution of the main resource incompatibilities identified in this paper, appears to be held up by lack of a Northern Land Use Planning Agreement (between the Federal and Territorial Governments and the Council for Yukon Indians). Without this agreement, there is no effective procedure for the territorial and Federal Governments and the Council for Yukon Indians to decide, jointly and systematically, objectives and guidelines for land allocation, land use, habitat maintenance and resource management; and there will be no framework for integrating the management of nonrenewable and renewable resources. In short, an important instrument for achieving the various natural resources management objectives of the Yukon is within easy reach but continues to be postponed. Regional environment and development planning is urgently needed for the greater Whitehorse region (Upper Yukon and Teslin drainage basins), because three-quarters of the Yukon's population lives there, along with most of the territory's major resource allocation and management issues. Such issues (e.g. allocation of land to agriculture or forestry) are generally regional in scope, and cannot be resolved successfully by planning that encompasses only a part of the region (e.g. the Whitehorse West district plan)--although these are valuable for other purposes.

Socioeconomic and environmental impact assessment

3.14 Although land-use planning is the chief mechanism for allocating land and water uses, it cannot anticipate the socioeconomic and environmental benefits and costs of particular development projects. This need is met by socioeconomic and environmental impact assessment (SEIA). SEIA is the identification and evaluation of potential positive and negative impacts of proposed development projects on the social, economic, biological and physical environments, together with identification of measures to avoid or mitigate negative impacts. The projects that should be subject to SEIA are usually major projects, but may also include smaller projects if they involve uses or potential impacts that have not been provided for by the planning process. Thus SEIA is a tool of environment and development planning, and works best in the context of an established land-use planning system.

3.15 At present, the Yukon has no systematic planning and limited SEIA. All large projects are potentially subject to federal environmental review, because they involve Crown land, federal money, or both; but smaller scale industrial projects may escape review. Most of the lands and resources are controlled by the Federal Government through the Department of Indian Affairs and Northern Development (DIAND); and DIAND is responsible both for environment and development planning and for coordination and review of socioeconomic and environmental effects of development projects in the Yukon. However, the established procedures are not working:

a. Some procedures overlap each other, and there are gaps between others.

b. The several committees involved are poorly coordinated.

c. Yukon Government representation on the committees is usually on a departmental basis, and a Yukon Government position is seldom developed.

d. The variety of review committees confuses project proponents.

e. Bands, communities, other resources users, and others that may be affected by the proposed project are seldom informed about the proposal in a timely and useful fashion; or some may be informed adequately, but not others.

f. There is little, and quite inadequate, scope for the review of development activities regulated by the Quartz and Placer Mining Acts or the Yukon Territorial Water Board.

g. The planning and review procedures operate in a policy vaccuum, with only partial policies for some sectors (e.g. agriculture), no policies for others (e.g. subsistence & forestry), and gaps between policies (see next section).

The main results of these deficiencies are that the balance among socioeconomic goals and among natural resources management objectives is made difficult (and probably impossible) to achieve; and the socioeconomic and environmental costs of particular developments may outweigh, or significantly reduce, the benefits. In addition, lack of effective planning and SEIA can mean that opportunities are missed for achieving the desired economic development and protecting the social and environmental values that might otherwise be threatened.

Cross-sectoral policy for the development and maintenance of the Yukon's natural resources

3.16 Land-use planning and SEIA are ways of implementing policy. To be fully effective they need policies in place covering the issues and choices they address. The Yukon, however, lacks policies for some sectors and uses (e.g. forestry, allocation of wildlife uses, wildlife habitat maintenance, freshwater fisheries, protected areas). For other sectors, policy is being formulated subsectorally--three agriculture-related policies are being developed, one for agriculture, one for grazing leases, and one for game farming and ranching. With major policy gaps such as these, planning and development review committees are left without guidance on whether a particular resource use should receive priority over others, or what regulations should govern that use.

3.17 Even when subsectoral policies are combined and coherent sectoral policies developed, they will run into trouble unless they are part of an overarching policy (or an overarching set of policies) covering the broader issues to which the sectoral policies must respond. These include housing, energy, food production, income and employment opportunities, and import

substitution. For example, food production policy would combine development of agriculture and aquaculture with maintenance of the habitats of harvested species required for subsistence, and would guide the allocation of land between habitat maintenance for subsistence and habitat conversion to agriculture. Without such policy, gains in food production from agriculture may be offset (or even outweighed) by losses of subsistence food production. Similarly, a significant proportion of the demand for farmland is in fact demand for rural housing--so housing policy and agricultural policy need to be linked to provide for rural housing in ways that avoid loss of important habitat or potentially valuable farmland.

3.18 What is needed is a cross-sectoral policy covering all actual and potential natural resource uses and sectors. A federal policy for mining (Northern Mineral Policy) is in place; so the priority need now is for a cross-sectoral policy for the development and maintenance of the Yukon's renewable resources. The policy should cover all aspects of renewable resource management, including sectors and activities that are currently under the jurisdiction of the federal government. There is a tendency to delay policy making for such sectors and activities, until a mandate is obtained for them; but a policy is needed to enable the territorial government to represent coherently the interests of Yukoners in the resources concerned. The policy should also cover relationships between renewable resources and policies on nonrenewable resources (including the Northern Mineral Policy) and on other sectors (such as energy, housing, and transportation) that have an impact on renewable resources. Such a policy would help government to anticipate potential competition among uses (including new uses); help it achieve the objectives and apply the principles proposed in this paper; and enable government to respond more effectively to the multisectoral nature of resource use on the ground.

Consultative procedures

3.19 Participants in the YUKON 2000 Fall Conference stressed the need for full participation at the community level in decisions on land and water uses. The allocation procedure should provide information to the public and a means for community residents to inform decision makers about what

they want. At the same time, it was recognized that it is also important to limit the costs, bureaucracy, and length of time of decision making (Yukon Development Strategy Fall Conference Report).

3.20 Yukoners number only 25,000 people. Decision making and consultative procedures should reflect this small scale. First, consultation at the community level should be easier than elsewhere in Canada, because there are few communities and, outside Whitehorse, they are small. Second, it is easy to exhaust small communities with excessive consultation: the scope of consultation should be appropriate to the level of decision being made (for example, routine decisions can be delegated to representative committees or councils; major decisions, involving value-based choices, usually call for direct consultation with the communities concerned). Third, communities and other interested parties should be given adequate time to respond to consultation invitations. Fourth, the number of different management, review and consultative bodies to which bands and communities have to relate, should be kept as few as possible.

3.21 The advantages of limiting the number of consultative and other bodies are that it cuts down bureaucracy and it reduces the burden of consultation on the bands and communities. The time required for consultation need not add significantly to the length of the development review process, which in any case could probably be reduced substantially by the adoption of comprehensive policies on the resources and uses concerned. The cost of providing communities and bands with sufficient and timely information on plans, project proposals and proposed resource management decisions need not be great and would likely be insignificant compared to the benefits of public participation in decision making. These include:

a) More information about local needs, problems, capabilities and experience (effective planning and implementation require specific information of the sort only local people can provide efficiently).

b) Better plans can be made that are more realistic about what is possible, what will be done, and what suits actual conditions best.

c) The judgement of people affected by development projects is essential for the evaluation of such projects.

Regional resource planning and management councils

3.22 The type and number of consultative bodies and other consultation mechanisms should be explored through YUKON 2000 and the Yukon Conservation Strategy. One option might be to set up regional resource planning and management councils, on which communities, bands, and user groups would be represented. Although at the territorial level it makes sense to have separate bodies dealing with harvest management, land-use planning, forest management, protected areas, and so on, retaining such divisions at the regional or more local levels would be excessively cumbersome (except for special cases such as band management of subsistence harvesting). Besides the need to limit the number of consultative and review bodies, planning and management overlap on a number of major local concerns (notably habitat maintenance). The geographical scope of regional resource councils is a matter for discussion. There could be one council for each major drainage basin (the major basins are: North Slope; Peel; Liard; Porcupine; Stewart; Pelly; Teslin; White; Lower Yukon; Upper Yukon; Alsek) or for administratively convenient combinations of drainage basins. Drainage basins (or combinations) are the preferred regional unit because most pollution goes downstream and so should be regulated according to drainage basin; river valleys are where most of the major resource use and management interactions take place; and most of the major harvested resources can be conveniently managed according to drainage basin (the main exception being harvested populations that occupy subalpine and alpine areas and move from one basin to another--an exception that can be accommodated quite easily through management at the territorial level and cooperative arrangements between regional resource councils).

4. RECOMMENDED ACTIONS

4.01 This chapter recommends actions by the public and private sectors to achieve the mechanisms proposed in chapter 3. The recommendations take account of the fact that more than 99% of the land in the Yukon is controlled by the Federal Government. Transfer of management responsibilities for forestry, freshwater fisheries, water, environmental protection, and other matters is expected eventually. But for the time being, the scope for action by the Yukon Government is somewhat limited; and achievement of the proposed mechanisms will call for close cooperation between the Federal and Yukon Governments. At the same time, land claims negotiations are under way between the Indian people and the two governments. The bands are seeking a combination of restoration of ownership of their traditional lands and effective participation in the management of the resources (land, wildlife, etc.) on which they depend for survival and socioeconomic development. Therefore, achievement of the proposed mechanisms also calls for close cooperation among the Indian people and the Federal and Yukon Governments. The issues and mechanisms discussed here are also being discussed as part of the land claims and devolution processes. Since we are not privy to either, we do not know how far (if at all) our recommendations coincide with proposals being considered in these processes.

4.02 Some of the recommended actions will be taken or developed in greater detail by the Yukon Conservation Strategy. The chapter begins with a brief explanation of the Yukon Conservation Strategy; and then looks at each of the proposed mechanisms in the same sequence as in chapter 3.

Yukon Conservation Strategy

4.03 The Yukon Conservation Strategy (YCS) is being prepared by the Dept of Renewable Resources as the renewable resources component of the YUKON 2000 Development Strategy. Other strategies that have been (or are being) prepared as part of YUKON 2000 include a Mineral Industry Strategy (together with the Northern Mineral Policy), the Yukon Tourism Strategy (Dept of Tourism), and the Yukon Training Strategy (Dept of Education). Subtitled "Strategy for the Sustainable Development of the

Yukon's Renewable Resources", the purpose of the YCS is: (a) to maintain the renewable resources of the Yukon; (b) to increase the socioeconomic benefits obtained by Yukoners from renewable resources; (c) to accommodate the needs and values of the various communities and interest groups of Yukoners; (d) to foster the rights and involvement of native people in renewable resource management and use; (e) to enable effective participation of Yukoners in policy making, planning, and other decisions on land and water uses in the Yukon; (f) to build a consensus among Yukoners on the development and conservation of renewable resources.

4.04 The YCS will consist of four components: (1) preparation and implemention of the YCS document; (2) selected demonstration projects; (3) preparation and implementation of local conservation strategies; (4) a consultation and information programme. The YCS document will be a policy document together with a strategy and action plan to implement the policy. It will take up and build on the report of the Select Committee on Renewable Resources, and on the sectoral and other reports prepared for YUKON 2000 (including this paper on the management of renewable resources). The theme of the YCS is that the needs of different resource users, and the development and conservation of renewable and nonrenewable resources, can and should be combined. Projects that demonstrate this theme will be identified and encouraged. Local conservation strategies will be prepared to help achieve this combination at regional, sub-regional and/or community levels; to guide and fine-tune the YCS; and to help it to reflect practical realities "on the ground". The consultation and information programmes of YUKON 2000 and the Select Committee on Renewable Resources have provided Yukoners with a series of opportunities to contribute to the evolution of the policies and actions that will be included in the YCS. The consultation and information programme of the YCS will therefore concentrate on discussing any new proposals (particularly concerning the cross-sectoral policy and its implementation), to enable bands, communities and user groups to participate fully in the formulation and implementation of the YCS, without repeating the previous consultations.

Renewable resource management systems

Harvest management system

4.05 The Yukon Government (Dept of Renewable Resources) is responsible for the management of all wild animal harvesting, except fishing (the responsibility of the federal Dept of Fisheries and Oceans) and native subsistence harvesting (the responsibility of the bands). With respect to fishing, the Select Committee on Renewable Resources has recommended that the Yukon Government continue negotiations with the Federal Government to ensure the transfer of responsibility for freshwater fisheries takes place "within two years" (responsibility for anadromous species [salmon] will remain with the Federal Government); conduct a comprehensive inventory of the Yukon fish resources; and formulate new policies and programs related to fisheries management. Formulation of new fisheries management policies can be done as part of the YCS. The comprehensive inventory, and formulation of management programmes, require funding, which (in view of the neglect of freshwater fisheries management) should be provided by the Federal Government as part of the transfer arrangements.

4.06 With respect to native subsistence, we recommend that the bands consider establishing conservation committees (or harvest management committees), which would be responsible for ensuring that band harvests are at sustainable levels. Such committees could assemble data necessary for management, such as size of harvested populations, condition of critical habitat, and numbers of animals harvested. They could also represent the bands in any joint management arrangements that may be made with the Yukon Government. The health of the harvested populations and their habitats is so important for the economic and cultural survival of the Indian people, for non-native Yukoners, and for the general economy of the Yukon, that we recommend that wherever possible joint management arrangements be made without delay. This could be done without prejudice to any agreement that may eventually be made though the lands claims negotiations.

4.07 Another matter requiring immediate action is the need for a management system to regulate any increase in harvesting pressure that may result from mining roads. Since the main problem is the access the roads provide to ridge tops where ATVs and 4x4s can range widely (and from where game is very easy to spot), the cheapest and most effective action would be to install a locked gate at the beginning of the road, and prohibit access to all except the mineral operation concerned. The main objective would concern roads funded by the Regional Roads to Resources programme, on the grounds that roads paid for by the public should be open to the public. However, it would be consistent with the proposed application of this programme--to enable development of one resource to coexist with development and/or maintenance of other resources--if use of the roads were restricted to achieve such coexistence.

System of integrated habitat maintenance

4.08 This proposal needs further elaboration in the Yukon Conservation Strategy. The Yukon is the only jurisdiction in Canada lacking protected areas for maintenance of wildlife habitat. It may be possible for many important habitats to be maintained and/or enhanced without including them in the protected area system, but some protected areas will be needed, and in any case room for manoeuvre is severely constrained by the division of responsibilities between the Federal and Yukon Governments and by the Yukon Quartz and Placer Mining Acts. The Northern Mineral Policy commits the Federal Government to a review of both Acts, and this could provide an opportunity to provide for habitat maintenance while achieving continued development of the mineral industry. Much of the necessary habitat inventory and identification work is expected to be done as part of a new programme of the Dept of Renewable Resources.

Forest management system

4.09 Forestry is currently the responsibility of the Federal Government (DIAND). The Select Committee on Renewable Resources has recommended that the Yukon Government continue negotiations with the Federal Government to ensure transfer of responsibility "within two years" for habitat

improvement, forest inventories, timber permits, and fuelwood lot management. Development of the proposed forest management system should be included in the preparations for this transfer; and could be done as part of the YCS.

Protected area system

4.10 A major step toward developing a protected areas system for the Yukon has been taken with completion of a "values framework and preliminary database", identifying the "values" (site categories) that the system should protect (MacPherson, Peterson & Peterson 1987). Their report (to the Dept of Renewable Resources, DIAND, and Environment Canada) recommends that the Yukon Conservation Strategy should "focus directly on a Protected Area System Plan that would have as its prime objective the eventual protection of all values..." The YCS should define what values are most urgently in need of protection and recommend to the Yukon Government what protective action is required.

Siting and operating standards and regulations

4.11 We recommend that the mineral industry get together with other interested parties (Council for Yukon Indians, wilderness travel industry, Yukon Trappers Association, etc.) to develop a code of conduct for exploration and development operations to limit the negative impact of these operations on wildlife and their habitats. We also recommend that the mineral and wilderness travel industries explore together the extent to which wilderness character can be maintained sufficiently by appropriate routing of roads and by operational practices (including reclamation and rehabilitation of roadways as soon as they cease to be used for their original purpose). The forest industry should also join this discussion, because of the detrimental effect on wilderness values of logging roads and operations. It would also probably be useful if the various users of non-renewable and renewable resources were to consider other issues where codes of conduct might be a feasible means of implementing siting and operating standards.

4.12 Water management and protection regulations and the granting of water use licences are the responsibility of the Federal Government. The Dept of Renewable Resources (1985) has stated the Yukon Government's wish to protect water for community use, for wildlife and fisheries habitat, for irrigation, and for wilderness recreation. Continuing and emerging problems with water quality include: (a) placer mining without the necessary safeguards significantly decreases water quality by dramatically increasing sediment loads; (b) toxic contamination of surface and ground waters from poorly constructed or maintained tailings areas; (c) surface water contamination because of poorly treated sewage released from the larger communities; (d) human health problems due to drinking untreated water, particularly downstream of communities; (e) pollution from outboard (or inboard) engines in small lakes that are not flushed by streams; (f) agricultural chemicals, unless well regulated (Dept of Renewable Resources 1985; Select Committee on Renewable Resources 1986). The Select Committee on Renewable Resources has recommended that the Yukon Government become more active in water-related matters through the development of management and protection regulations.

Combining development with conservation, and increasing the resource base

4.13 This is a field where most of the initiatives should come from the private sector. There is considerable scope for combined development and conservation projects along the lines indicated earlier. The mineral industry could do a great deal to win support from wildlife and wilderness users by working with them to include wildlife conservation in mineral development projects. Renewable resource sectors that devise innovative and economically practicable projects for the sustainable development of the Yukon's indigenous plant and animal resources could well attract the support of private investment as well as public sources of funding, such as the Renewable Resources Subagreement of the Canada/Yukon Economic Development Agreement.

Environment and development planning; and socioeconomic and environmental impact assessment

4.14 General regional land-use planning awaits conclusion of the Northern Land Use Planning Agreement. It is important that this be done; but, as stated in chapter 3, urgent regional planning should not be postponed any longer. We therefore recommend that the Yukon and Federal Governments and the Council for Yukon Indians make arrangements as soon as possible to undertake a regional environment and development plan for the greater Whitehorse region--without prejudice to negotiations concerning the Northern Land Use Planning Agreement. Also needed urgently is a step-by-step procedure for introducing systematic planning together with socioeconomic and environmental impact assessment, designed (among other things) to correct the problems listed in paragraph 3.15 (a to g).

Framework and structures to implement the proposed mechanisms

4.15 The framework for the proposed mechanisms is the cross-sectoral policy, a major element of which is the cross-sectoral policy for the development and maintenance of the Yukon's renewable resources to be formulated as part of the Yukon Conservation Strategy. The structures should include consultative procedures such as regional resource planning and management councils. As suggested in chapter 3, the type and number of consultative bodes and other consultation mechanisms should be explored through YUKON 2000 and the YCS. The structures should be no more or less than is required to implement the cross-sectoral policy. The task of developing this policy is the Yukon Government's, in cooperation with all Yukoners and the Federal Government.

TABLE 2.1 Yukon mineral industry statistics 1982-1986

	1982	1983	1984	1985	1986[1]
Employment: Hardrock mines	0[2]	192	516	303	772
Employment: Placer mines	650	600	734	700	700
Exploration expenditures ($ million)	22	12	12	12	30-35
Mineral production ($ million)	169	62	70	76	184
Quartz claims/leases in good standing, Dec.	52,634	47,356	47,475	46,301	46,060
Placer claims/leases in good standing, Dec.	16,457	15,476	15,516	14,739	14,935

Notes: (1) 1986 figures are preliminary
(2) end of year employment figure

Source: Canada Dept of Indian and Northern Affairs, Exploration and Geological Services Division

TABLE 2.2 Native subsistence harvest by Band

	EDIBLE WEIGHT KG (ADJUSTED)		$$ VALUE (ADJUSTED)	
OLD CROW				
Big mammals	58,878.0	(60,450.1)	$542,266.38	($556,745.42)
Small mammals	1,792.81	(2,435.9)	$ 14,790.68	($ 20,096.18)
Birds	232.05	(315.3)	$ 1,680.04	($ 2,282.77)
Fish	9,545.8	(10,197.2)	$ 78,561.94	($ 83,922.97)
Subtotals:	70,448.66	(73,398.5)	$637,299.04	($663,047.34)
TESLIN				
Big mammals	7,675.5	(14,563.0)	$ 38,531.01	($ 73,106.26)
Small mammals	184.8	(350.7)	$ 927.70	($ 1,760.51)
Birds	119.0	(225.7)	$ 502.18	($ 952.45)
Fish	6,091.2	(8,085.1)	$ 23,999.32	($ 31,855.30)
Subtotals:	14,070.5	(23,224.5)	$ 63,960.21	($107,674.52)
ROSS RIVER				
Big mammals	40,527.0	(45,030.0)	$303,141.96	($336,824.40)
Small mammals	6,937.0	(7,707.8)	$ 51,403.17	($ 57,114.80)
Birds	335.0	(372.2)	$ 1,688.40	($ 1,875.89)
Fish	15,191.0	(16,598.7)	$ 59,852.54	($ 65,398.88)
Subtotals:	62,990.0	(69,708.7)	$416,086.07	($461,213.97)

Sources: See paragraph 2.13

TABLE 2.3 Native subsistence harvest by animal category

	EDIBLE WEIGHT KG (ADJUSTED)		$ VALUE (ADJUSTED)	
BIG MAMMALS				
Old Crow	58,878.0	(60,450.1)	$ 542,266.38	($ 556,745.42)
Teslin	7,675.5	(14,563.0)	$ 38,531.01	($ 73,106.26)
Ross River	40,527.0	(45,030.0)	$ 303,141.96	($ 336,824.40)
Subtotals:	107,080.5	(120,043.1)	$ 883,939.35	($ 966,676.08)
SMALL MAMMALS				
Old Crow	1,792.81	(2,435.9)	$ 14,790.68	($ 20,096.18)
Teslin	184.8	(350.7)	$ 927.70	($ 1,760.51)
Ross River	6,937.0	(7,707.8)	$ 51,403.17	($ 57,114.80)
Subtotals:	8,914.61	(10,494.4)	$ 67,121.55	($ 78,971.49)
BIRDS				
Old Crow	232.05	(315.3)	$ 1,680.04	($ 2,282.77)
Teslin	119.0	(225.7)	$ 502.18	($ 952.45)
Ross River	335.0	(372.2)	$ 1,688.40	($ 1,875.89)
Subtotals:	686.05	(913.2)	$ 3,870.62	($ 5,111.11)
FISH				
Old Crow	9,545.8	(10,197.2)	$ 78,561.94	($ 83,922.97)
Teslin	6,091.2	(8,085.1)	$ 23,999.32	($ 31,855.30)
Ross River	15,191.0	(16,598.7)	$ 59,852.54	($ 65,398.88)
Subtotals:	30,828.0	(34,881.0)	$ 162,413.80	($ 181,177.15)
TOTAL	147,509.16	(166,331.7)	$1,117,345.32	($1,231,935.83)

Sources: See paragraph 2.3

Table 2.4 Subsistence and recreational harvest by non-native Yukoners

ANIMAL CATEGORY	EDIBLE WEIGHT (kg)	$$ VALUE
Big mammals	152,672.0	$ 763,360.00
Birds	4,679.93	$ 23,399.65
Fish	84,759.6	$ 423,798.00
Totals:	242,111.53	$1,210,557.65

Sources: Dept of Renewable Resources data for Yukon Conservation Stretegy

TABLE 2.5 Furbearers in the Yukon: annual average number harvested and value 1981-1985

SPECIES	NUMBER HARVESTED	$$VALUE (% OF TOTAL VALUE)
Lynx	2,159	$ 752,109 (62%)
American marten	4,912	$ 254,019 (21%)
Muskrat	13,275	$ 47,899 (4%)
Wolverine	195	$ 42,735 (3.5%)
Red fox	564	$ 42,533 (3.5%)
	SUBTOTAL:	$1,139,295 (94%)
American beaver	703	$ 18,305 (1.5%)
American mink	455	$ 14,305 (1%)
American red squirrel	12,025	$ 14,291 (1%)
Wolf	155	$ 13,837 (1%)
Coyote	169	$ 10,268 (1%)
Canadian otter	30	$ 1,340 (less than 1%)
American black bear Brown/grizzly bear	17	$ 1,101 (less than 1%)
Polar bear	2*	$ 800*
Ermine	340	$ 773 (less than 1%)
Fisher	2	$ 272 (less than 1%)
Arctic fox	7	$ 265 (less than 1%)

*Note: These are figures for 1980/81 season only
Source: Statistics Canada 1983, 1984, 1985 & 1986

TABLE 2.6 Commercial fishing in the Yukon: annual average harvested and value 1981-1985

SPECIES	NUMBER HARVESTED	KG. HARVESTED	$$VALUE
Anadromous :			
Chinook	10,429	77,025	$ 219,600
Chum	22,248	67,023	$ 55,000
subtotal:	32,677	144,048	$ 274,600
Freshwater :			
Whitefish	?	5,040	$ 11,200
Lake trout	?	3,000	$ 7,400
subtotal:		8,040	$ 18,600
TOTAL FISH	?	152,088	$ 293,200

Sources: Yukon Department of Economic Development 1986; G. Zealand 13 February 1987

TABLE 2.7 **Forestry in the Yukon: annual average output production and value 1981-1985**

SUBDIVISION	PRODUCTION	VALUE
Logging	66,701.4 m^3	$ 1,553,600
-Fuelwood	38,855.6 m^3	$ 1,032,200
-Sawlogs	24,048.6 m^3	$ 323,200
-Roundlogs	3,797.2 m^3	$ 198,200
Cone gathering	2,206.4 hl	$ 176,400
TOTAL		$ 1,730,000

Source: Yukon Department of Economic Development 1986

Table 2.8 Distribution of land in the Yukon suitable for crop production or native grazing (hectares)

LOCALITY AND DRAINAGE BASIN	------CROP PRODUCTION------			-------NATIVE GRAZING-------		
	Class 3	Class 4	Class 5	Class 3	Class 4	Class 5
Dawson:						
Lower Yukon	171	439	87,081	2,312	4,179	6,485
Mayo/Stewart Crossing:						
Stewart	2,534	21,236	79,831	1,083	--	21,400
Pelly Crossing:						
Pelly/Lower Yukon	5,219	14,680	126,188	213	4,997	49,011
Carmacks:						
Upper Yukon	2,178	5,653	17,533	--	--	15,141
Faro:						
Pelly	--	478	17,049	--	--	6,590
Ross River:						
Pelly	--	166	14,863	--	--	15,895
Haines Junction (Takhini-Dezadeash):						
Upper Yukon/Alsek	--	--	126,215	2,199	4,008	43,004
Whitehorse/Carcross:						
Upper Yukon	--	--	73,240	6,543*	1,851	50,739
Watson Lake:						
Liard	4,410	6,037	209,267	--	128	342
Beaver Creek:						
White	--	--	35,821	--	--	12,874
TOTAL YUKON	14,512	48,689	787,088	12,350*	19,702	221,481

Notes: Crop production classes
Class 3: land with moderate limitations that restrict the range of crops or require special conservation practices (suitable for cereal production)
Class 4: land with severe limitations that restrict the range of crops or require special conservation practices or both
Class 5: land with very severe limitations for sustained arable agriculture (suitable only for fodder and forage and frost hardy vegetables)

Native grazing classes
Class 2: 450-900 kg/ha (dry weight) of palatable forage
Class 3: 200-450 kg/ha (dry weight) of palatable forage
Class 4: 100-200 kg/ha (dry weight) of palatable forage
Class 5: 10-100 kg/ha (dry weight) of palatable forage (marginal for grazing: should be used only when supplemented by nearby higher yielding areas)

*includes 2,144 hectares rated Class 2
-- = none

Source: Rostad, Kozak & Acton 1977

Table 2.9 Estimated direct revenues of the Yukon wilderness/adventure travel industry

	$000		
MARKET SEGMENT	1980(1)	1986(2)	Potential(2)
Sport/trophy hunting	2,500	4,200	4,564
Sport/trophy fishing	550	1,609	3,627
Subtotal sport hunting & fishing	3,050	5,809	8,191
"Adventure travel"	450	1,686	4,144
Subtotal nonharvesting activities	450	1,686	4,144
TOTAL:	3,500	7,495	12,335

Sources: (1) Hepple et al. (1982)
(2) Yukon Dept of Tourism (1986)

Table 2.10 Importance of big mammal and bird harvests for subsistence and tourism in the Yukon

	Subsistence hunting by		
	Native bands	Non-natives	Hunting by tourists
BIG MAMMALS			
Caribou	major	major	major
Moose	major	major	major
Dall's sheep	?	minor	major
Grizzly bear	?	?	major
Black bear	minor	minor	minor
Mountain goat	?	minor	minor
BIRDS			
Upland game			
Grouse (mostly spruce + ruffed)	major	major	?
Ptarmigan	minor	minor	?
Waterfowl			
Ducks	major	major	?
Geese	major	major	?

Big Mammals

Notes: Native subsistence data based on two bands--Old Crow (for 1983-84 season) (Murphy 1986) and Teslin (for 1984) (Duerden 1986)
Non-native subsistence data based on average annual recreational harvest for the period 1981-85 (Yukon Department of Economic Development 1986)
Tourist data based on average annual harvest for the period 1976/77-1980/81 (Yukon River Basin Committee 1984)
Major = one of the species making up at least 90% of the total edible weight of the big mammal subsistence harvest, and at least 90% of the total number of big mammals harvested by tourists
? = no data

Birds

Notes: Native data based on estimated average annual harvests for the years 1981, 1982, 1983 + 1984 by all 12 Yukon bands (Yukon Department of Renewable Resources internal documents)
Non-native data based on estimated average annual harvests for the years 1981, 1982, 1983 + 1984 (Yukon Department of Renewable Resources internal documents)
Major = one of the species groups making up at least 90% of the total edible weight of the birds harvested
? = no data

Table 2.11 Importance of fish harvests for subsistence, commerce and tourism in the Yukon

FISH	Subsistence fishing: Native bands	Subsistence fishing: Non-natives	Commerical fishing	Fishing by tourists
Salmon:				
Chinook	major	major	major	major
Sockeye	major	major	--	major
Coho	major	major	--	minor
Chum	major	minor	major	--
Non-salmon species:				
Lake trout	major	major	major	major
Northern pike	major	major	minor	major
Arctic grayling	major	major	--	major
Whitefish (mostly lake whitefish)	major	minor	major	minor
Burbot	major	?	minor	--
Suckers (mostly longnose sucker)	major	?	minor	--
Rainbow trout	?	minor	--	minor
Arctic char	?	minor	--	minor
Inconnu	minor	?	minor	--
Dolly varden	minor	?	--	--

Salmon

Notes: Native subsistence data based on 1985 harvest by all 12 Yukon bands (Seigel & McKenzie 1985)
Non-native data for chinook + chum based on the average annual domestic subsistence harvests for the period 1981-85 (Yukon Department of Economic Development 1986) added to the average annual sportfishing harvests for 1980 and 1985 (Department of Fisheries and Oceans 1983 & 198?)
Non-native data for sockeye + coho, and tourist data, based on the average annual sportfishing harvests for 1980 and 1985 (Department of Fisheries and Oceans 1983 & 198?)
Commercial data on chinook + chum based on the average annual harvest for the period 1981-85 (Yukon Department of Economic Development 1986)
Major = one of the species making up at least 90% of the total edible weight of salmon subsistence and commercial harvests, and at least 90% of the total number of salmon harvested by tourists
? = no data
-- = not fished or negligible

Non-salmon

Notes: Native subsistence data based on one band--Teslin (for 1984) (Duerden 1986)
Non-native data for lake trout + whitefish based on the average annual domestic subsistence harvest for the period 1981-85 (Yukon Department of Economic Development 1986) added to the average annual sportfishing harvests for 1980 and 1985 (Department of Fisheries and Oceans 1983 & 198?)
Non-native data for all other species, and tourist data, based on the average annual sportfishing harvests for 1980 and 1985 (Department of Fisheries and Oceans 1983 & 198?)
Commercial data on lake trout + whitefish based on the average annual harvest for the period 1981-85 (Yukon Department of Economic Development 1986); on northern pike, burbot, suckers and inconnu for 1982 (Environmental Protection Service & Canadian Resourcecon Ltd. 1983)
Major = one of the species making up at least 90% of the total edible weight of non-salmon subsistence and commercial harvests, and at least 90% of the total number of non-salmon species harvested by tourists
? = no data
-- = not fished or negligible